

Mega_Link 2

APPLICATION NOTE AN038

Modbus TCP Interface Using a Moxa MB3180 Gateway

Summary

Mega_Link and Mega_Link 2 systems are widely used for transferring ‘Real-World’ physical data between locations and different sites. Typically, instrumentation data inputs from one or multiple outstations are brought back to a central basestation unit.

In some applications the basestation unit is then interfaced to a local PLC or SCADA system using a Modbus interface to pass on the gathered instrumentation data inputs digitally.

Historically, PLCs have the ability to communicate via Modbus RTU over RS232 or RS485 serial interface. However, in recent years this type of interface has begun to be superseded by an Ethernet interface based on TCP/IP protocol called “Modbus TCP”.

This application note shows how Mega_Link 1 and Mega_Link 2 can be interfaced to a PLC, SCADA system or third-party telemetry system using the Modbus TCP protocol by means of a third-party Modbus TCP gateway device.

The document covers the readily available Moxa MB3180 Gateway.

1. References

- Ref. 1 AN030 Modbus Register Address Mapping
- Ref. 2 AN031 Modbus Register Address Listing
- Ref. 3 AN032 Mega_Link 2 Using the Modbus RTU **Slave** Mode on COM3A/3B
- Ref. 4 AN033 Mega_Link 2 Using the Modbus RTU **Master** Mode on COM3A/3B

2. Introduction

Historically, PLCs have the ability to communicate with other devices via Modbus RTU over RS232 or RS485 serial interface. However, in recent years this type of interface has begun to be superseded by an Ethernet based interface based on TCP/IP protocol. This is more convenient because of the easy RJ45 based Ethernet cables and Local Area Networks.

Mega_Link and Mega_Link 2 have been designed to interface using Modbus RTU over RS232 or RS485 via the COM3A/COM3B serial interface port.

This document describes how to use the Moxa MB3180 Gateway to translate or bridge between the two protocols and media types, effectively providing a Modbus TCP interface for situations where the traditional Modbus RTU protocol is unavailable.

This document describes using the Moxa MB3180 and Mega_Link 2 operating in Modbus TCP **Slave** mode as application example 1. Although, configuration windows are shown for the Moxa MB3180 for information purposes, everything shown and used is the “Factory Default” setting so no actual configuration changes are necessary.

This document also describes using the Moxa MB3180 and Mega_Link 2 operating in Modbus TCP **Master** mode as application example 2. This does require changing the configuration settings for the Moxa MB3180.

3. Modbus TCP to Modbus RTU RS232 Gateway

3.1 Moxa MB3180



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3.2 Example Basestation Layout



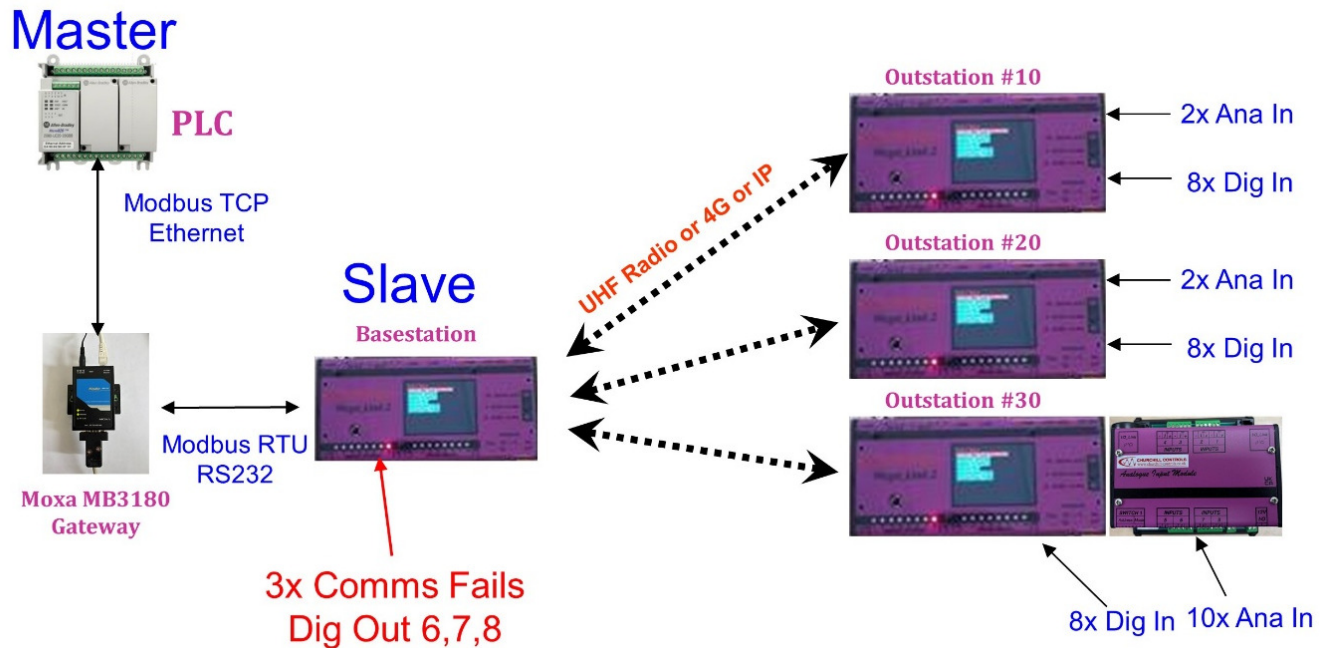
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4. Application Example 1 - PLC Master

This example describes a PLC **Master** interfacing to a Mega_Link 2 **Slave** Basestation gathering real world inputs from remote outstations OS10, OS20 & OS30. The OS30 also has an analogue input expansion module fitted.



Each outstation is configured with a Mega_Link 2 address, #10, #20 and #30.

The Mega_Link 2 Basestation **Slave** must be configured with a slave ID, in this example Slave ID = 1.

The PLC **Master** must be configured to pass data to/from specific database locations within the Basestation.

The PLC programmer/user needs to understand the structure of the Mega_Link 2 database to determine which database address locations to use.

4.1 Example Requirements

In this example there are three outstation sites.

Outstation #10 – 8x Digital Inputs, 2x Analogue Inputs

Outstation #20 – 8x Digital Inputs, 2x Analogue Inputs

Outstation #30 – 8x Digital Inputs, 10x Analogue Inputs

4.2 Basestation Configuration

In this example the analogue input signals will be gathered together at the basestation where they are available for the PLC to read them out using Modbus.

The basestation configuration is very simple.

It is recommended that basic outstation comms fail alarms be set as described.

4.3 General

All software configuration of Fieldbus/Bus_Link is carried out using the DCD2 software that is supplied on a memory stick with every Mega_Link 2 system. Alternatively, it can be downloaded from our website on www.churchill-controls.co.uk.

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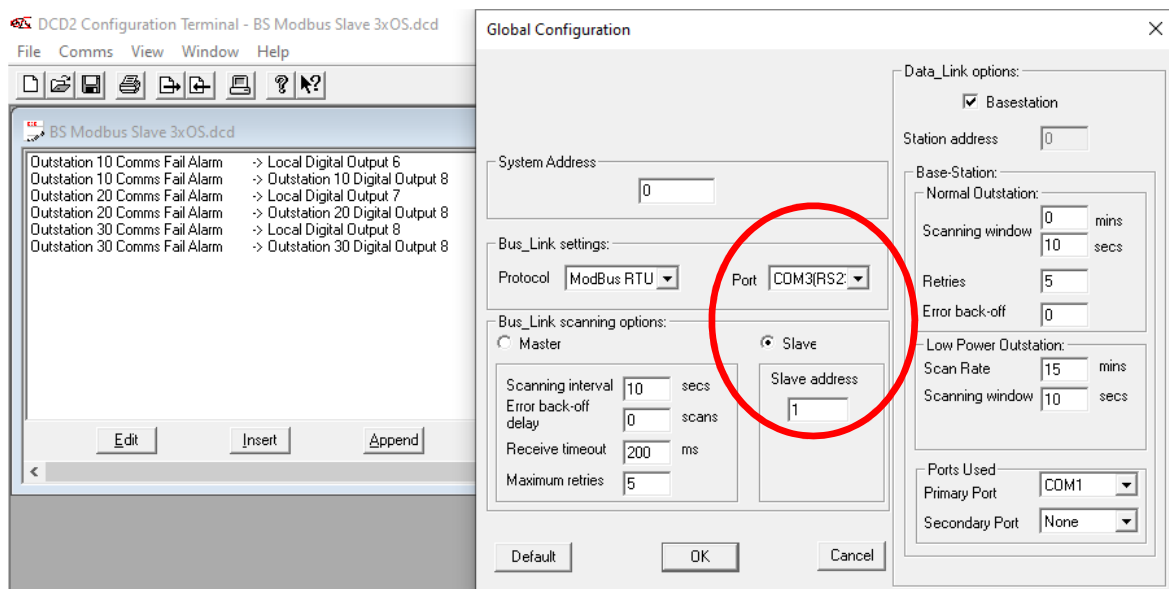
When DCD2 is running, a configuration can be created either by opening an existing file, creating a new file or uploading the configuration from a Mega_Link 2. Each configuration creates a new window.

4.4 Mega Link 2 Protocol Selection

These settings can be chosen by clicking on the 'Global' button. This will open a dialog box called 'Global Configuration' as follows:

This example is setting Modbus RTU mode via COM3(RS232).

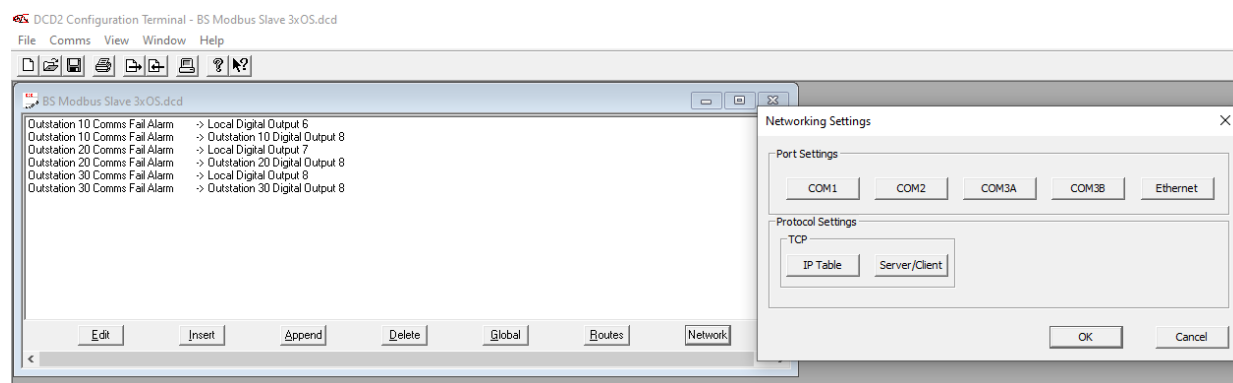
It has set Slave mode and the Slave address ID = 1.



4.5 Mega Link 2 Protocol Parameters

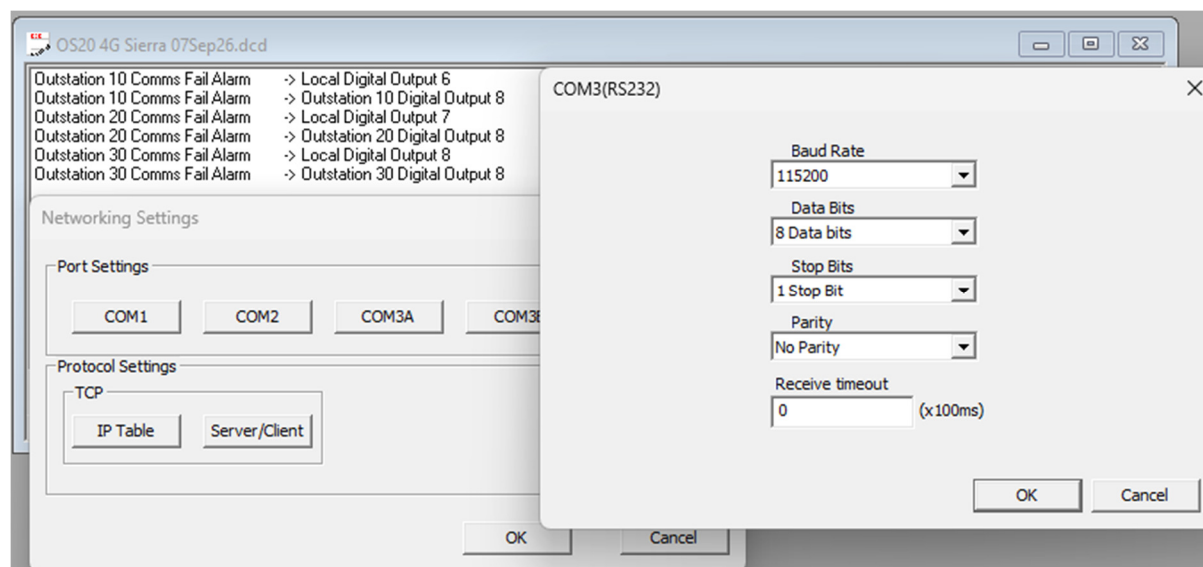
When linking the two pieces of equipment together, their data formats must be matched. That is, both units must be working on the same protocol, at the same data speed, using the same number of data bits, the same number of stop bits and the same parity.

These settings can be chosen by clicking on the 'Network' button. This will open a dialog box called 'Network Setting' as follows:



Click on the 'COM3A' tab (For RS232).

The parameters shown should be self-explanatory, and must match those of the Moxa MB3180 Gateway.



The "Receive timeout" parameter is not relevant for Modbus mode.

4.6 Moxa MB3180 Configuration for Modbus RTU to Modbus TCP Slave mode.

For this example 1, please refer to the following annexes:

Annex 1 **Windows 10 PC Set-Up for Operation**

Annex 2 **Moxa MB3180 Configuration for Modbus TCP in Slave Mode**

4.7 Mega Link 2 Database

The Mega_Link 2 basestation unit maintains a database of 2000 input registers, 2000 output registers, 8000 digital inputs and 8000 digital outputs. Mega_Link 2 maps all the I/O from the basestation and outstations into this database in a well-defined, structured way. DCD2 knows the structure and simplifies identification of each I/O point into simple terminology, such as 'Outstation 10 Digital Input 1'.

With Mega_Link 2 configured as a Fieldbus/Bus_Link slave, the user needs to know the database format so they can access the relevant registers.

The Database register addressing is explained in the following documents.

Ref. 1 AN030 Modbus Register Address Mapping

Ref. 2 AN031 Modbus Register Address Listing

Outstation #10

02 Read Discrete Inputs (1x)	Address	04 Read Input Registers (3x)	Address
Digital I/P #1	328	Analogue I/P #1	86
Digital I/P #2	329	Analogue I/P #2	87
Digital I/P #3	330		
Digital I/P #4	331		

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Digital I/P #5	332		
Digital I/P #6	333		
Digital I/P #7	334		
Digital I/P #8	335		

Outstation #20

02 Read Discrete Inputs (1x)	Address	04 Read Input Registers (3x)	Address
Digital I/P #1	648	Analogue I/P #1	166
Digital I/P #2	649	Analogue I/P #2	167
Digital I/P #3	650		
Digital I/P #4	651		
Digital I/P #5	652		
Digital I/P #6	653		
Digital I/P #7	654		
Digital I/P #8	655		

Outstation #30

02 Read Discrete Inputs (1x)	Address	04 Read Input Registers (3x)	Address
Digital I/P #1	968	Analogue I/P #1	246
Digital I/P #2	969	Analogue I/P #2	247
Digital I/P #3	970	Analogue I/P #3	248
Digital I/P #4	971	Analogue I/P #4	249
Digital I/P #5	972	Analogue I/P #5	250
Digital I/P #6	973	Analogue I/P #6	251
Digital I/P #7	974	Analogue I/P #7	252
Digital I/P #8	975	Analogue I/P #8	253
		Analogue I/P #9	254
		Analogue I/P #10	255

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4.8 Using Modbus Poll to Simulate the Master PLC

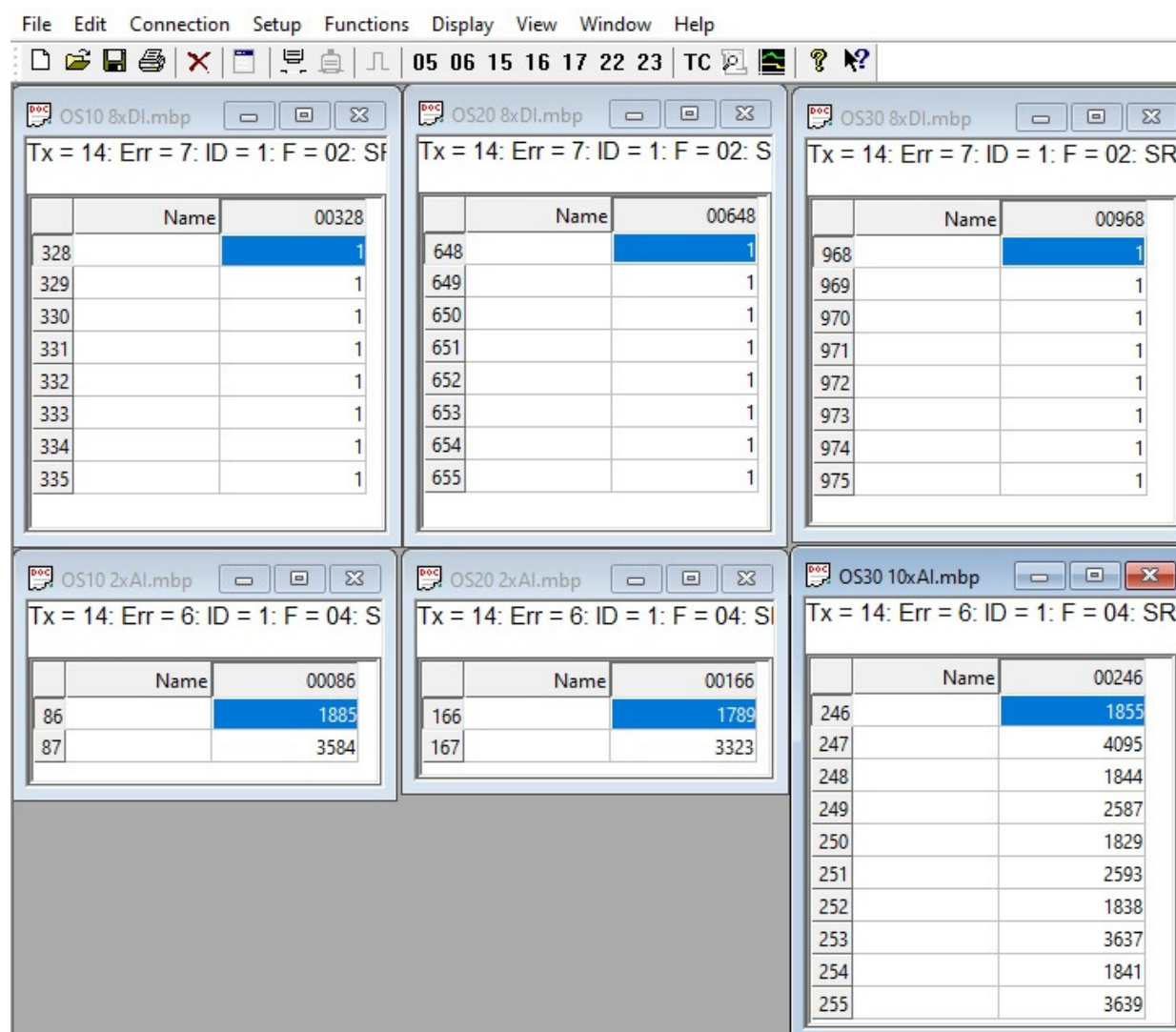
Multiple Modbus Poll windows are used to gather digital inputs and analogue inputs from the three outstations.

The detailed window set-ups for Modbus Poll to work with Modbus TCP, are shown in:

Annex 3 Modbus Poll Command Window Set-Ups for Example 1

Below shows the result of Modbus Poll screen in operation.

Top Left	8 Digital Inputs from Outstation #10 (starting at add 328)
Top Middle	8 Digital Inputs from Outstation #20 (starting at add 648)
Top Right	8 Digital Inputs from Outstation #30 (starting at add 968)
Bottom Left	2 Analogue Inputs from Outstation #10 (starting at add 86)
Bottom Middle	2 Analogue Inputs from Outstation #20 (starting at add 166)
Bottom Right	10 Analogue Inputs from Outstation #30 (starting at add 246)



Looking at address 86 above, the data reading is 1885. This works out as $20 \times 1885 / 4000 = 9.42$ mA.

Looking at the register values in section 3.10 below, at address 86 this was 9.42 mA.

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4.9 Diagnostic View of Mega Link Communications

Below is the “D” command at the Basestation using the diagnostics terminal feature of DCD 2.

You can see that the Basestation polls Outstation #10, then 10 seconds later it polls Outstation #20 then another 10 seconds later it polls Outstation #30 and then 10 seconds after this it polls Outstation #31 which is the Analogue Input expansion module connected to Outstation #30.

```
Outstation: 10
09:02:57 TX: 01 1A 00 00 0A 0C 00 20 00 00 00 00 00 00 00 00 00 00 AF FF 00 00 00 00 0A 04 C1 C9 C2 09 01 3C
Time-out set to 4700ms.
Primary comms rcvd pkt
09:02:59 RX: 01 16 00 0A 00 0D 7F FF 00 00 11 00 11 00 0E 00 10 00 01 07 B3 FF 54 07 F2 0D 01 00 C1 DE
2800ms left. Good reply.

1 sec to next poll.

Outstation: 20
09:03:07 TX: 01 1A 00 00 14 0C 00 80 00 00 00 00 00 00 00 00 00 00 AF FF 00 00 00 00 0A 04 CB C9 C2 09 B1 37
Time-out set to 4700ms.
Primary comms rcvd pkt
09:03:09 RX: 01 16 00 14 00 0D 7F FF 00 00 02 00 02 00 02 00 02 00 12 07 AF FF 55 07 F5 0D 01 00 3F F1
2800ms left. Good reply.

1 sec to next poll.

Outstation: 30
09:03:17 TX: 01 1A 00 00 1E 0C 00 80 00 00 00 00 00 00 00 00 00 00 B1 FF 00 00 00 00 0A 04 D5 C9 C2 09 10 96
Time-out set to 4700ms.
Primary comms rcvd pkt
09:03:19 RX: 01 16 00 1E 00 0D 7F FF 00 00 01 00 01 00 01 00 02 00 0A 07 B1 FF FA 06 EC 0C 01 00 29 C4
2900ms left. Good reply.

1 sec to next poll.

Outstation: 31
09:03:27 TX: 01 04 00 00 1F 03 DF C9 C2 09 CE E5

Requesting Outstation: 31 (expansion module) Time-out set to 4700ms.
Primary comms rcvd pkt
09:03:29 RX: 01 16 00 1F 00 02 00 00 00 00 38 07 20 0A 3C 07 41 0A 35 07 3E 0E 35 07 3F 0E 02 00 46 41
3100ms left. (expansion module) Good reply.

End of fast scan. Scanning every 10 secs
Scanned 4 Outstations with 0 failures
```

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4.10 Diagnostic View of Mega Link 2 Digital Inputs

Using the ID (Display Input Digitals) command at the Basestation using the diagnostics terminal feature of DCD2.

INPUT DIGITALS									
Alarm Flags:									
C: Mega Link2 Comms Fail									
B: Battery Low									
H: Hardware Fail									
M: Field Bus Fail									
F: Complete Comms Fail									
A: Batt not charging									
P: Primary Comms Fail									
S: Secondary Comms Fail									
Reg No.	Block No.	0	15	16	31	0	15	16	31
0:	0:	S000000000	000000000000000000						
64:	2:								
128:	4:								
192:	6:								
256:	8:								
320:	10:	S11111111	000000000000000000						
384:	12:								
448:	14:								
512:	16:								
576:	18:								
640:	20:	S11111111	000000000000000000						
704:	22:								
768:	24:								
832:	26:								
896:	28:								
960:	30:	S11111111	000000000000000000	000000000000000000	000000000000000000				
1024:	32:								
1088:	34:								
1152:	36:								
1216:	38:								
1280:	40:								
1344:	42:								
1408:	44:								
1472:	46:								
1536:	48:								
1600:	50:								
1664:	52:								
1728:	54:								
1792:	56:								
1856:	58:								
1920:	60:								
1984:	62:								

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4.11 Diagnostic View of Mega Link 2 Analogue Inputs

Using the IR (Display Input Registers) command at the Basestation using the diagnostics terminal feature of DCD2.

Tera Term - [disconnected] VT

File Edit Setup Control Window Help

INPUT REGISTERS

If analogues not 0..20mA, scale as necessary

Reg No.	Block No.	0	1	2	3	4	5	6	7
0:	0:	10	10	10	10	12.16V	-77dBm	0.37mA	0.35mA
8:	1:	-	-	-	-	-	-	-	-
16:	2:	-	-	-	-	-	-	-	-
24:	3:	-	-	-	-	-	-	-	-
32:	4:	-	-	-	-	-	-	-	-
40:	5:	-	-	-	-	-	-	-	-
48:	6:	-	-	-	-	-	-	-	-
56:	7:	-	-	-	-	-	-	-	-
64:	8:	-	-	-	-	-	-	-	-
72:	9:	-	-	-	-	-	-	-	-
80:	10:	6	6	6	6	12.30V	-85dBm	9.42mA	17.92mA
88:	11:	-	-	-	-	-	-	-	-
96:	12:	-	-	-	-	-	-	-	-
104:	13:	-	-	-	-	-	-	-	-
112:	14:	-	-	-	-	-	-	-	-
120:	15:	-	-	-	-	-	-	-	-
128:	16:	-	-	-	-	-	-	-	-
136:	17:	-	-	-	-	-	-	-	-
144:	18:	-	-	-	-	-	-	-	-
152:	19:	-	-	-	-	-	-	-	-
160:	20:	4	4	4	5	12.20V	-78dBm	8.94mA	16.61mA
168:	21:	-	-	-	-	-	-	-	-
176:	22:	-	-	-	-	-	-	-	-
184:	23:	-	-	-	-	-	-	-	-
192:	24:	-	-	-	-	-	-	-	-
200:	25:	-	-	-	-	-	-	-	-
208:	26:	-	-	-	-	-	-	-	-
216:	27:	-	-	-	-	-	-	-	-
224:	28:	-	-	-	-	-	-	-	-
232:	29:	-	-	-	-	-	-	-	-
240:	30:	4	4	4	4	12.29V	-96dBm	9.25mA	20.47mA
248:	31:	9.22mA	12.93mA	9.14mA	12.96mA	9.19mA	18.18mA	9.20mA	18.19mA E
256:	32:	-	-	-	-	-	-	-	-
264:	33:	-	-	-	-	-	-	-	-
272:	34:	-	-	-	-	-	-	-	-
280:	35:	-	-	-	-	-	-	-	-
288:	36:	-	-	-	-	-	-	-	-

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4.12 Diagnostic View of Modbus Communications

Here is the view of communications at Modbus Poll on the PC.

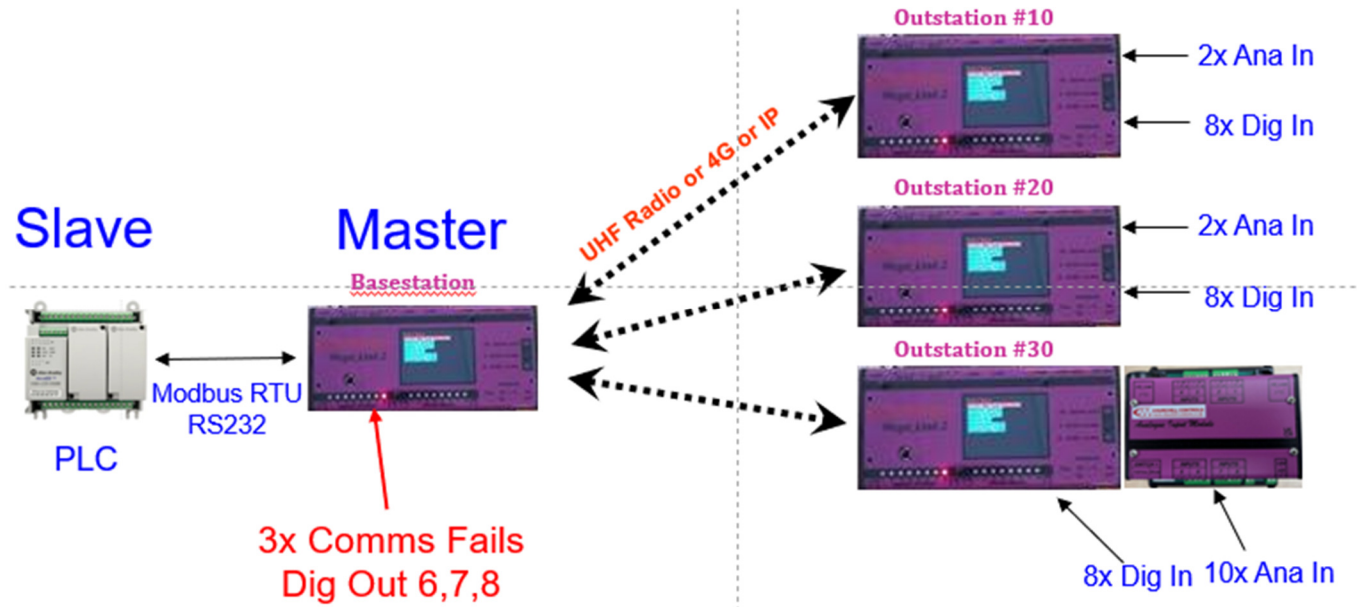
17	09:08:02.201	8	Tx	01 04 00 56 00 02 91 DB
18	09:08:02.669	9	Rx	01 04 04 07 54 0D F2 3E 35
19	09:08:03.185	8	Tx	01 04 00 A6 00 02 91 E8
20	09:08:03.669	9	Rx	01 04 04 07 56 0D F5 DE 37
21	09:08:04.185	8	Tx	01 04 00 F6 00 0A 90 3F
22	09:08:04.684	25	Rx	01 04 14 06 FA 0C ED 07 37 0A 20 07 3B 0A 40 07 34 0E 3E 07 35 0E 3F DC 9B
23	09:08:05.200	8	Tx	01 02 01 48 00 08 F8 26
24	09:08:05.669	6	Rx	01 02 01 FF E1 C8
25	09:08:06.184	8	Tx	01 02 02 88 00 08 F8 5E
26	09:08:06.668	6	Rx	01 02 01 FF E1 C8
27	09:08:07.184	8	Tx	01 02 03 C8 00 08 F8 76
28	09:08:07.668	6	Rx	01 02 01 FF E1 C8

Here is the “B” command at the Basestation using the diagnostics terminal feature of DCD 2.

```
-----
FIELD_BUS SLAVE (Modbus RTU)
16:14:18 RX: 01 04 00 56 00 02 91 DB Read input registers 86..87
16:14:18 TX: 01 04 04 07 55 0D F5 2E 37
16:14:19 RX: 01 04 00 A6 00 02 91 E8 Read input registers 166..167
16:14:19 TX: 01 04 04 07 59 0D F6 AE 35
16:14:20 RX: 01 04 00 F6 00 0A 90 3F Read input registers 246..255
16:14:20 TX: 01 04 14 06 FC 0C F2 07 3A 0A 23 07 3D 0A 43 07 36 0E 41 07 37 0E 43 38 B0
16:14:21 RX: 01 02 01 48 00 08 F8 26 Read input status 328..335
16:14:21 TX: 01 02 01 FF E1 C8
16:14:22 RX: 01 02 02 88 00 08 F8 5E Read input status 648..655
16:14:22 TX: 01 02 01 FF E1 C8
16:14:23 RX: 01 02 03 C8 00 08 F8 76 Read input status 968..975
16:14:23 TX: 01 02 01 FF E1 C8
```

5. Application Example 2 - PLC Slave

This example describes a PLC **Slave** interfacing to a Mega_Link 2 **Master** basestation gathering real world inputs from remote outstations OS10, OS20 & OS30. OS30 also has an analogue input expansion module fitted.



Each outstation is configured with a Mega_Link 2 address, #10, #20 and #30.

The Mega_Link 2 basestation **Master** must be configured to pass data to/from specific register locations within the PLC **Slave**. The PLC **Slave** needs to be configured with a slave ID, in this example Slave ID = 1.

5.1 Example Requirements

In this example there are three outstation sites.

Outstation #10 – 8x Digital Inputs, 2x Analogue Inputs

Outstation #20 – 8x Digital Inputs, 2x Analogue Inputs

Outstation #30 – 8x Digital Inputs, 10x Analogue Inputs

5.2 Basestation Configuration

In this example the analogue input signals will be gathered together at the basestation and transferred by the basestation writing to the PLC using Modbus.

The configuration in the basestation **Master** is required to control the transfer of analogue and digital inputs to the PLC **Slave**.

It is recommended that basic outstation comms fail alarms be set as described.

5.3 General

All software configuration of Fieldbus/Bus_Link is carried out using the DCD2 software that is supplied on a memory stick with every Mega_Link 2 system. Alternatively, it can be downloaded from our website on www.churchill-controls.co.uk.

When DCD2 is running, a configuration can be created either by opening an existing file, creating a new file or uploading the configuration from a Mega_Link 2. Each configuration creates a new window.

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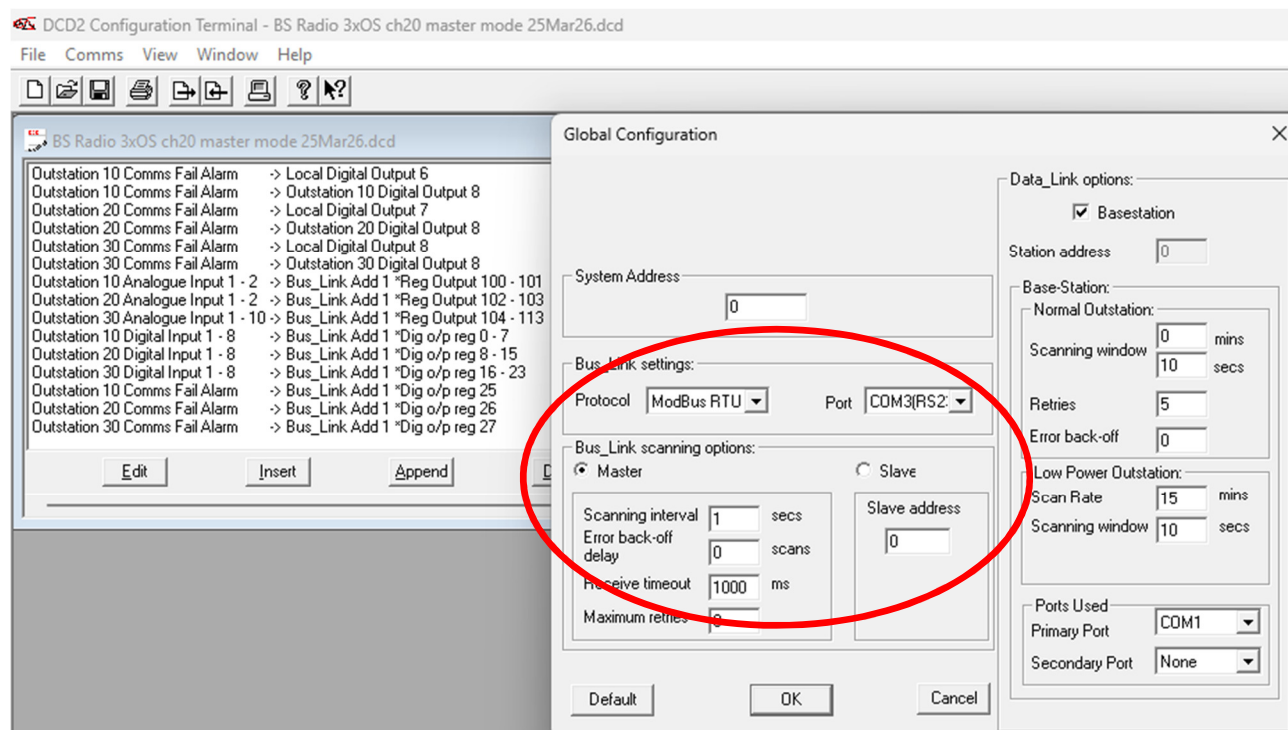
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5.4 Protocol Selection

These settings can be chosen by clicking on the 'Global' button. This will open a dialog box called 'Global Configuration' as follows:

This example is setting Modbus RTU mode via COM3(RS232).

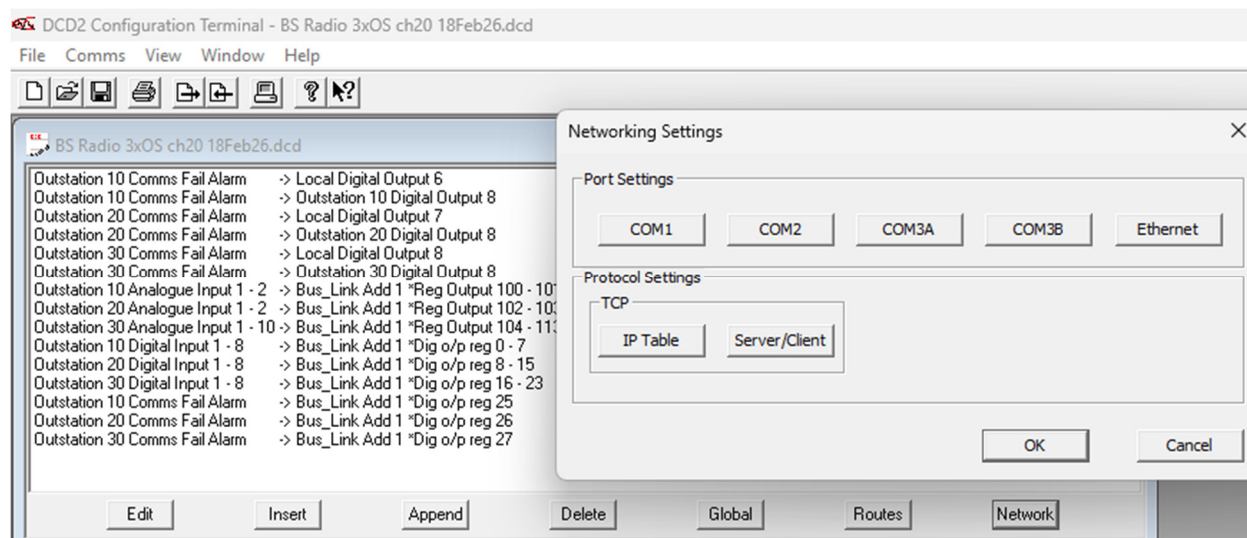
It has been set in **Master** mode and the scanning interval is 1 secs, Receive timeout=1000 ms with no retries.



5.5 Protocol Parameters

When linking the two pieces of equipment together, their data formats must be matched. That is, both units must be working on the same protocol, at the same data speed, using the same number of data bits, the same number of stop bits and the same parity.

These settings can be chosen by clicking on the 'Network' button. This will open a dialog box called 'Network Setting' as follows:



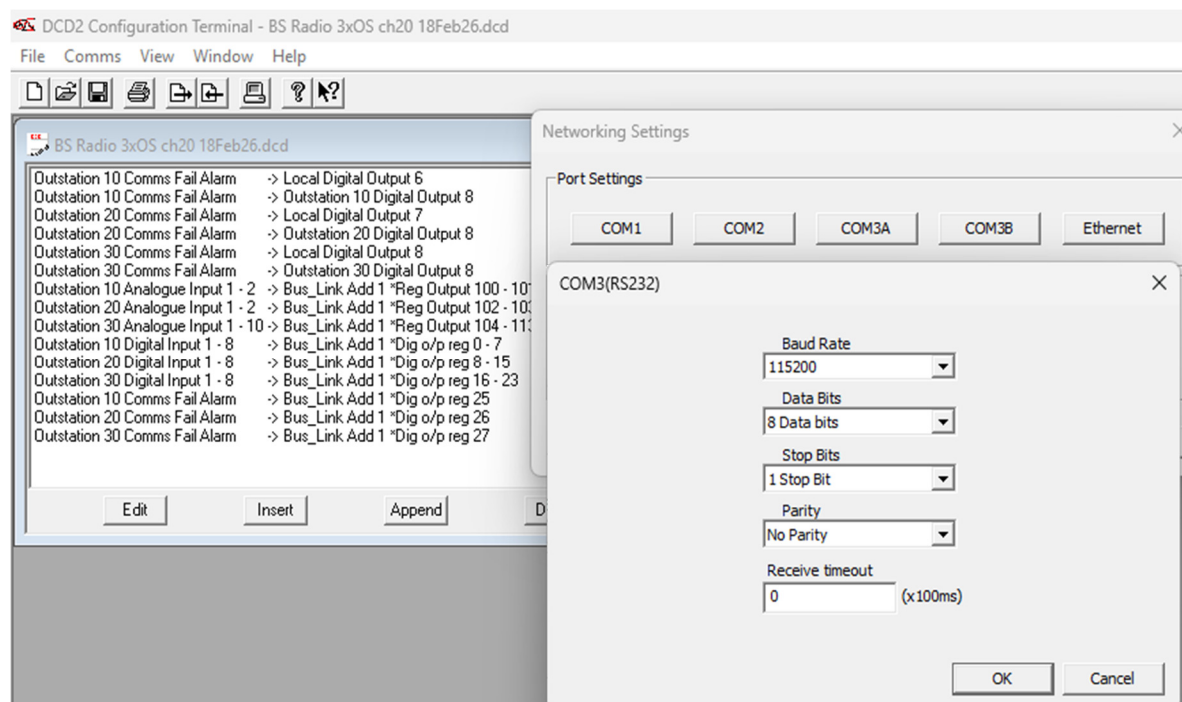
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Click on the 'COM3A' tab (For RS232).

The parameters shown should be self-explanatory, and must match those of the Moxa MB3180 Gateway.



The "Receive timeout" parameter is not relevant for Modbus mode.

5.6 Moxa MB3180 Configuration for Modbus RTU to Modbus TCP Master mode.

For this example 2, please refer to the following annexes:

Annex 1 **Windows 10 PC Set-Up for Operation**

Annex 4 **Moxa MB3180 Configuration for Modbus TCP in Master Mode**

5.7 Mega Link 2 Configuration

The Mega_Link 2 Basestation unit configuration must include entries to command the relevant analogue and digital input transfer to the PLC.

Analogue Inputs

```
Line 8 - Outstation 10 Analogue Input 1 - 2 -> Bus_Link Add 1 *Reg Output 100 - 101
Line 9 - Outstation 20 Analogue Input 1 - 2 -> Bus_Link Add 1 *Reg Output 102 - 103
Line 10 - Outstation 30 Analogue Input 1 - 10 -> Bus_Link Add 1 *Reg Output 104 - 113
```

Line 8 will send Outstation 10 Analogue Inputs 1-2 to PLC slave ID=1 into addresses 100 – 101

Line 9 will send Outstation 20 Analogue Inputs 1-2 to PLC slave ID=1 into addresses 102 – 103

Line 10 will send Outstation 30 Analogue Inputs 1-10 to PLC slave ID=1 into addresses 104 – 113

Outstation 30 has an analogue input expansion module fitted, hence $2 + 8 = 10$ inputs available.

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Digital Inputs

Line 11 - Outstation 10 Digital Input 1 - 8 -> Bus_Link Add 1 *Dig o/p reg 0 - 7
Line 12 - Outstation 20 Digital Input 1 - 8 -> Bus_Link Add 1 *Dig o/p reg 8 - 15
Line 13 - Outstation 30 Digital Input 1 - 8 -> Bus_Link Add 1 *Dig o/p reg 16 - 23

Line 11 will send Outstation 10 Digital Inputs 1-8 to PLC slave ID=1 into addresses 0 – 7

Line 12 will send Outstation 20 Digital Inputs 1-8 to PLC slave ID=1 into addresses 8 – 15

Line 13 will send Outstation 30 Digital Inputs 1-8 to PLC slave ID=1 into addresses 16 – 23

Comms Fails

Line 14 - Outstation 10 Comms Fail Alarm -> Bus_Link Add 1 *Dig o/p reg 25
Line 15 - Outstation 20 Comms Fail Alarm -> Bus_Link Add 1 *Dig o/p reg 26
Line 16 - Outstation 30 Comms Fail Alarm -> Bus_Link Add 1 *Dig o/p reg 27

Line 14 will send Outstation 10 Comms Fail Alarm to PLC slave ID=1 into addresses 25

Line 15 will send Outstation 20 Comms Fail Alarm to PLC slave ID=1 into addresses 26

Line 16 will send Outstation 30 Comms Fail Alarm to PLC slave ID=1 into addresses 27

5.8 Using Modbus Slave to Simulate the Slave PLC

Modbus Slave windows are used to act as destination registers and coils.

The detailed window set-ups for Modbus Slave to work with Modbus TCP, are shown in:

Annex 5 Modbus Slave Command Window Set-Ups for Example 2

Left hand window	2 Analogue Inputs from Outstation #10 (starting at address 100) 2 Analogue Inputs from Outstation #20 (starting at address 102) 10 Analogue Inputs from Outstation #30 (starting at address 104)
Middle window	8 Digital Inputs from Outstation #10 (starting at address 0) 8 Digital Inputs from Outstation #20 (starting at address 8) 8 Digital Inputs from Outstation #30 (starting at address 16)
Left hand window	1 Comms Fail Alarm from Outstation #10 (at address 25) 1 Comms Fail Alarm from Outstation #20 (at address 26) 1 Comms Fail Alarm from Outstation #30 (at address 27)

Modbus Slave - OS10 20 30exp 14regs at addr100 25Mar26.mbs

File Edit Connection Setup Display View Window Help

OS10 20 30exp 14... Rx = 1908: ID = 1: F = 03

	Name	00100
100		1879
101		3574
102		1788
103		3312
104		1851
105		4095
106		1843
107		2586
108		1846
109		2618
110		1840
111		3636
112		1841
113		3638

OS10 20 30exp... Rx = 1835: ID = 1: F = 01

	Name	00000
0		1
1		1
2		1
3		1
4		1
5		1
6		1
7		1
8		1
9		1
10		1
11		1
12		1
13		1
14		1
15		1
16		1
17		1
18		1
19		1
20		1
21		1
22		1
23		1

OS10 20 30 co... Rx = 1836: ID = 1: F = 01

	Name	00025
25		1
26		1
27		1

Looking at address 100 above, the data reading is 1879. This works out as $20 \times 1879 / 4000 = 9.39$ mA.

Looking at the register values in section 3.10 below, at address 86 this was 9.39 mA.

5.9 Diagnostic View of Mega Link Communications

Below is the "D" command at the Basestation using the diagnostics terminal feature of DCD 2.

You can see that the Basestation polls Outstation #10, then 10 seconds later it polls Outstation #20 then another 10 seconds later it polls Outstation #30 and then 10 seconds after this it polls Outstation #31 which is the Analogue Input expansion module connected to Outstation #30.

5.10 Diagnostic View of Mega Link 2 Digital Inputs

Using the ID (Display Input Digitals) command at the Basestation using the diagnostics terminal feature of DCD2.

INPUT DIGITALS

Alarm Flags:

C: Mega_Link2 Comms Fail

B: Battery Low

H: Hardware Fail

M: Field Bus Fail

F: Complete Comms Fail

A: Batt not charging

P: Primary Comms Fail

S: Secondary Comms Fail

Reg	Block	15			31			15			31		
No.	No.	0	15	16	31	0	15	16	31	0	15	16	31
0:	0:	M_____S00000000			0000000000000000			-----			-----		
64:	2:	-----			-----			-----			-----		
128:	4:	-----			-----			-----			-----		
192:	6:	-----			-----			-----			-----		
256:	8:	-----			-----			-----			-----		
320:	10:	_____S11111111			0000000000000000			-----			-----		
384:	12:	-----			-----			-----			-----		
448:	14:	-----			-----			-----			-----		
512:	16:	-----			-----			-----			-----		
576:	18:	-----			-----			-----			-----		
640:	20:	_____S11111111			0000000000000000			-----			-----		
704:	22:	-----			-----			-----			-----		
768:	24:	-----			-----			-----			-----		
832:	26:	-----			-----			-----			-----		
896:	28:	-----			-----			-----			-----		
960:	30:	_____S11111111			0000000000000000			0000000000000000			0000000000000000		
1024:	32:	-----			-----			-----			-----		
1088:	34:	-----			-----			-----			-----		
1152:	36:	-----			-----			-----			-----		
1216:	38:	-----			-----			-----			-----		
1280:	40:	-----			-----			-----			-----		

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5.11 Diagnostic View of Mega Link 2 Analogue Inputs

Using the IR (Display Input Registers) command at the Basestation using the diagnostics terminal feature of DCD2.

INPUT REGISTERS									
If analogues not 0..20mA, scale as necessary									
Reg No.	Block No.	0	1	2	3	4	5	6	7
0:	0:	10	10	10	10	12.14V	-74dBm	0.37mA	0.35mA
8:	1:	-	-	-	-	-	-	-	-
16:	2:	-	-	-	-	-	-	-	-
24:	3:	-	-	-	-	-	-	-	-
32:	4:	-	-	-	-	-	-	-	-
40:	5:	-	-	-	-	-	-	-	-
48:	6:	-	-	-	-	-	-	-	-
56:	7:	-	-	-	-	-	-	-	-
64:	8:	-	-	-	-	-	-	-	-
72:	9:	-	-	-	-	-	-	-	-
80:	10:	6	6	6	6	12.35V	-81dBm	9.39mA	17.87mA
88:	11:	-	-	-	-	-	-	-	-
96:	12:	-	-	-	-	-	-	-	-
104:	13:	-	-	-	-	-	-	-	-
112:	14:	-	-	-	-	-	-	-	-
120:	15:	-	-	-	-	-	-	-	-
128:	16:	-	-	-	-	-	-	-	-
136:	17:	-	-	-	-	-	-	-	-
144:	18:	-	-	-	-	-	-	-	-
152:	19:	-	-	-	-	-	-	-	-
160:	20:	4	4	4	5	12.14V	-79dBm	8.94mA	16.55mA
168:	21:	-	-	-	-	-	-	-	-
176:	22:	-	-	-	-	-	-	-	-
184:	23:	-	-	-	-	-	-	-	-
192:	24:	-	-	-	-	-	-	-	-
200:	25:	-	-	-	-	-	-	-	-
208:	26:	-	-	-	-	-	-	-	-
216:	27:	-	-	-	-	-	-	-	-
224:	28:	-	-	-	-	-	-	-	-
232:	29:	-	-	-	-	-	-	-	-
240:	30:	4	4	4	4	12.27V	-88dBm	9.25mA	20.47mA
248:	31:	9.21mA	12.93mA	9.23mA	13.09mA	9.20mA	18.18mA	9.20mA	18.19mA E
256:	32:	-	-	-	-	-	-	-	-
264:	33:	-	-	-	-	-	-	-	-
272:	34:	-	-	-	-	-	-	-	-
280:	35:	-	-	-	-	-	-	-	-
288:	36:	-	-	-	-	-	-	-	-

5.12 Diagnostic View of Modbus Communications

Here is the “B” command at the Basestation using the diagnostics terminal feature of DCD 2.

FIELD_BUS MASTER (Modbus RTU)

13:00:14 TX: 01 10 00 64 00 02 04 07 5D 0E 00 60 B2 Presetting Multiple registers 100..101 of Modbus address 1

13:00:14 RX: 01 10 00 64 00 02 00 17

13:00:15 TX: 01 10 00 66 00 02 04 06 FD 0C FB A0 56 Presetting Multiple registers 102..103 of Modbus address 1

13:00:15 RX: 01 10 00 66 00 02 A1 D7

13:00:15 TX: 01 10 00 68 00 0A 14 07 3E 0F FF 07 32 0A 19 07 36 0A 39 07 2F 0E 33 07 30 0E 35 62 61 Presetting Multiple registers 104..113 of Modbus address 1

13:00:16 RX: 01 10 00 68 00 0A C1 D2

13:00:16 TX: 01 0F 00 00 00 08 01 FF BE D5 Force Multiple coils 0..7 of Modbus address 1

13:00:17 RX: 01 0F 00 00 00 08 54 0D

13:00:17 TX: 01 0F 00 08 00 08 01 FF 5F 14 Force Multiple coils 8..15 of Modbus address 1

13:00:18 RX: 01 0F 00 08 00 08 D5 CF

13:00:18 TX: 01 0F 00 10 00 08 01 FF 7F 16 Force Multiple coils 16..23 of Modbus address 1

13:00:18 RX: 01 0F 00 10 00 08 55 C8

13:00:19 TX: 01 0F 00 19 00 01 01 01 F2 95 Force Multiple coils 25 of Modbus address 1

13:00:19 RX: 01 0F 00 19 00 01 45 CC

13:00:20 TX: 01 0F 00 1A 00 01 01 01 B6 95 Force Multiple coils 26 of Modbus address 1

13:00:20 RX: 01 0F 00 1A 00 01 B5 CC

13:00:20 TX: 01 0F 00 1B 00 01 01 01 8B 55 Force Multiple coils 27 of Modbus address 1

13:00:21 RX: 01 0F 00 1B 00 01 E4 0C

Here is the view of communications at Modbus Slave on the PC.

24	13:37:55.034	13	Rx	01 10 00 64 00 02 04 07 56 0D F8 10 02
25	13:37:55.034	8	Tx	01 10 00 64 00 02 00 17
26	13:37:55.743	13	Rx	01 10 00 66 00 02 04 06 FB 0C F0 01 90
27	13:37:55.743	8	Tx	01 10 00 66 00 02 A1 D7
28	13:37:56.687	29	Rx	01 10 00 68 00 0A 14 07 3B 0F FF 07 33 0A 1A 07 36 0A 3A 07 30 0E 34 07 31 0E 3...
29	13:37:56.687	8	Tx	01 10 00 68 00 0A C1 D2
30	13:37:57.410	10	Rx	01 0F 00 00 00 08 01 FF BE D5
31	13:37:57.410	8	Tx	01 0F 00 00 00 08 54 0D
32	13:37:58.120	10	Rx	01 0F 00 08 00 08 01 FF 5F 14
33	13:37:58.120	8	Tx	01 0F 00 08 00 08 D5 CF
34	13:37:58.831	10	Rx	01 0F 00 10 00 08 01 FF 7F 16
35	13:37:58.831	8	Tx	01 0F 00 10 00 08 55 C8
36	13:37:59.544	10	Rx	01 0F 00 19 00 01 01 01 F2 95
37	13:37:59.544	8	Tx	01 0F 00 19 00 01 45 CC
38	13:38:00.474	10	Rx	01 0F 00 1A 00 01 01 01 B6 95
39	13:38:00.474	8	Tx	01 0F 00 1A 00 01 B5 CC
40	13:38:01.412	10	Rx	01 0F 00 1B 00 01 01 01 8B 55
41	13:38:01.412	8	Tx	01 0F 00 1B 00 01 E4 0C

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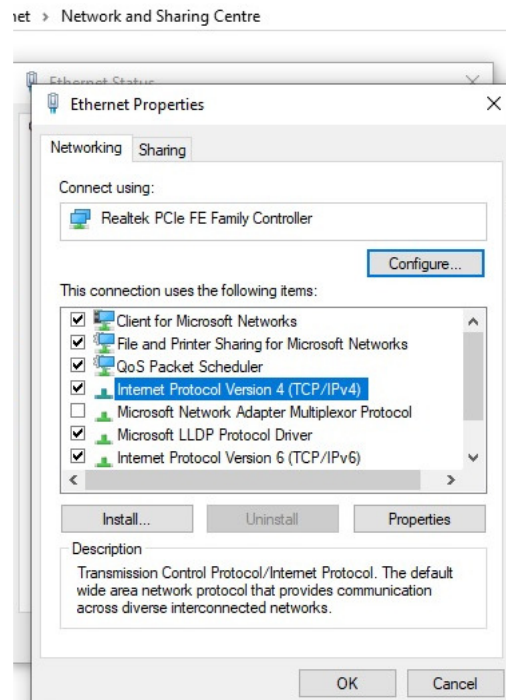
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Annex 1 **Windows 10 PC Set-Up for Operation**

To interface a Windows 10 PC running Modbus Poll (or Modbus Slave) with the Moxa MB3180 Gateway over the Ethernet interface is necessary to manually select a manual fixed IP address on the Network setting of the PC.

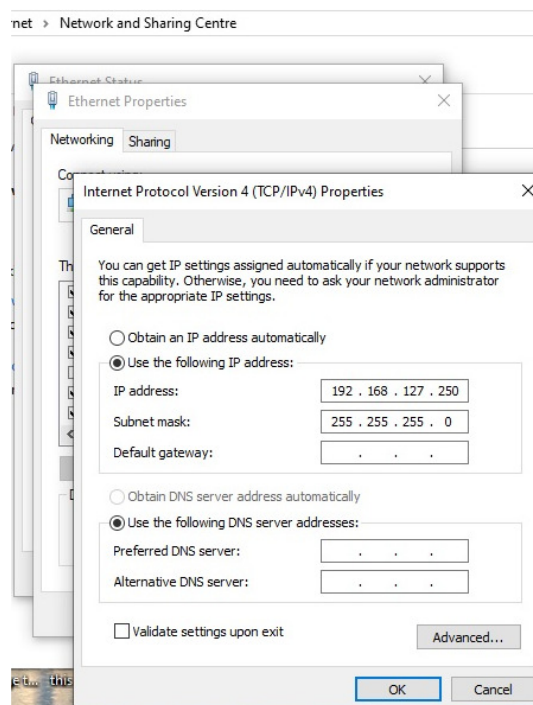
Navigate to Ethernet Properties:



Highlight the “Internet Protocol Version 4 (TCP/IPv4)” and click on “Properties”.

Instead of the default “Obtain an IP address automatically”, Select “Use the following IP address and enter a manual IP address, in the same range as the IP address of the Moxa MB3180, something like 192.168.127.250.

Set the subnet mask to 255.255.255.0

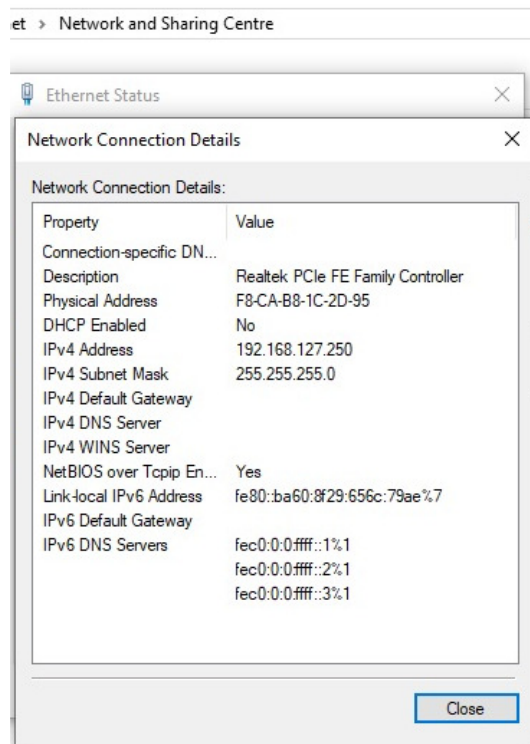


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To check, navigate to the Network Connection Details, as follows.

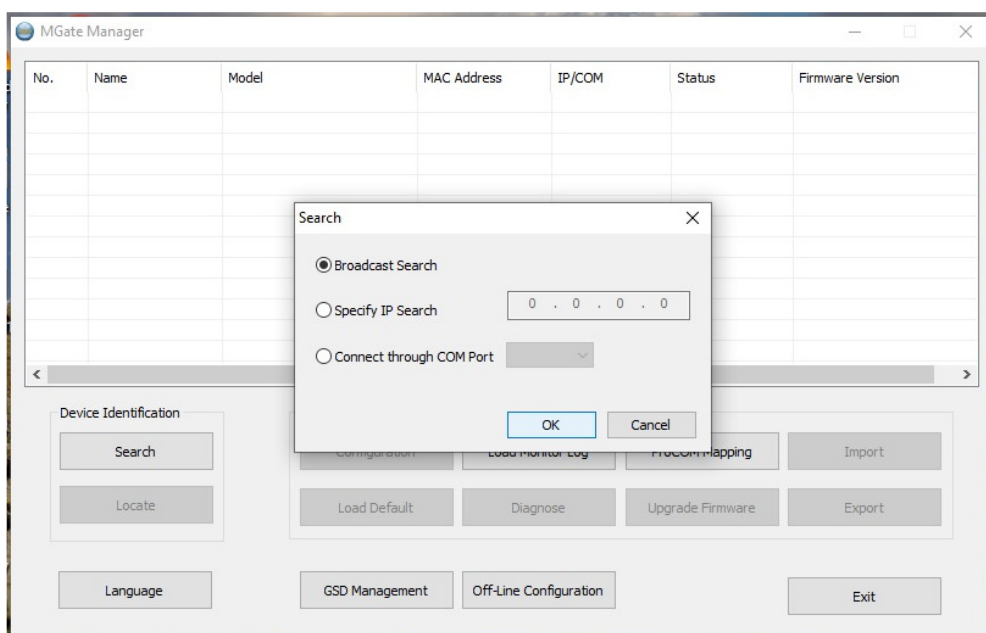


Annex 2 Moxa MB3180 Configuration for Modbus TCP in Slave Mode

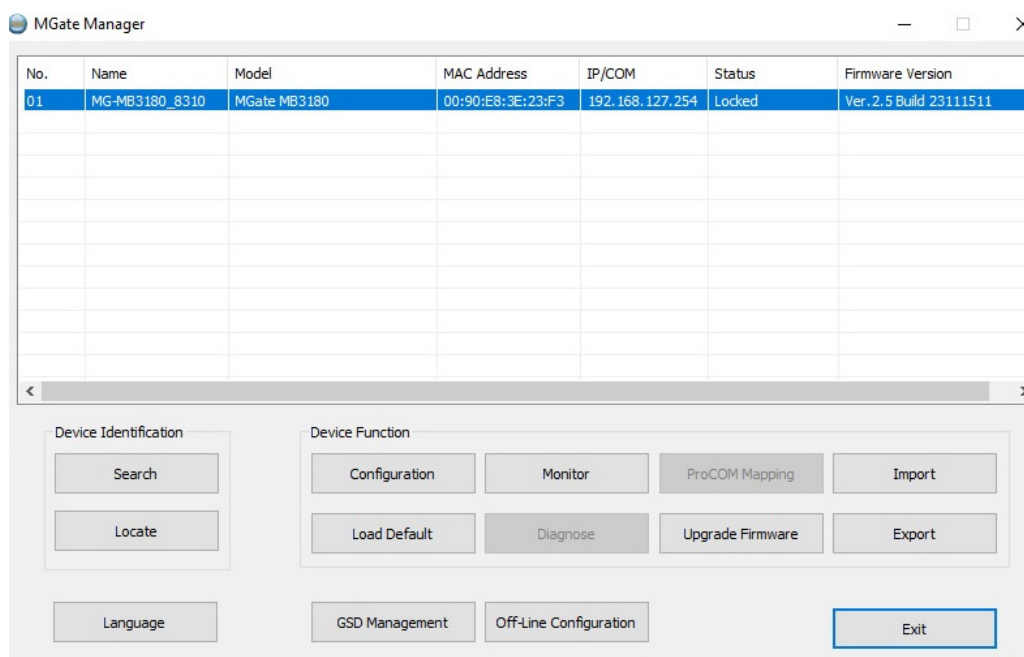
The following configuration shows the default out-of-the-box configuration (or after applying the “Load Default” command).

MOXA MGate Manager

Open MGate Manager and click on “Search” button:



and click OK for “Broadcast Search” option:



This shows the default IP address of the unit is 192.168.127.254.

Highlight the line of the discovered device.

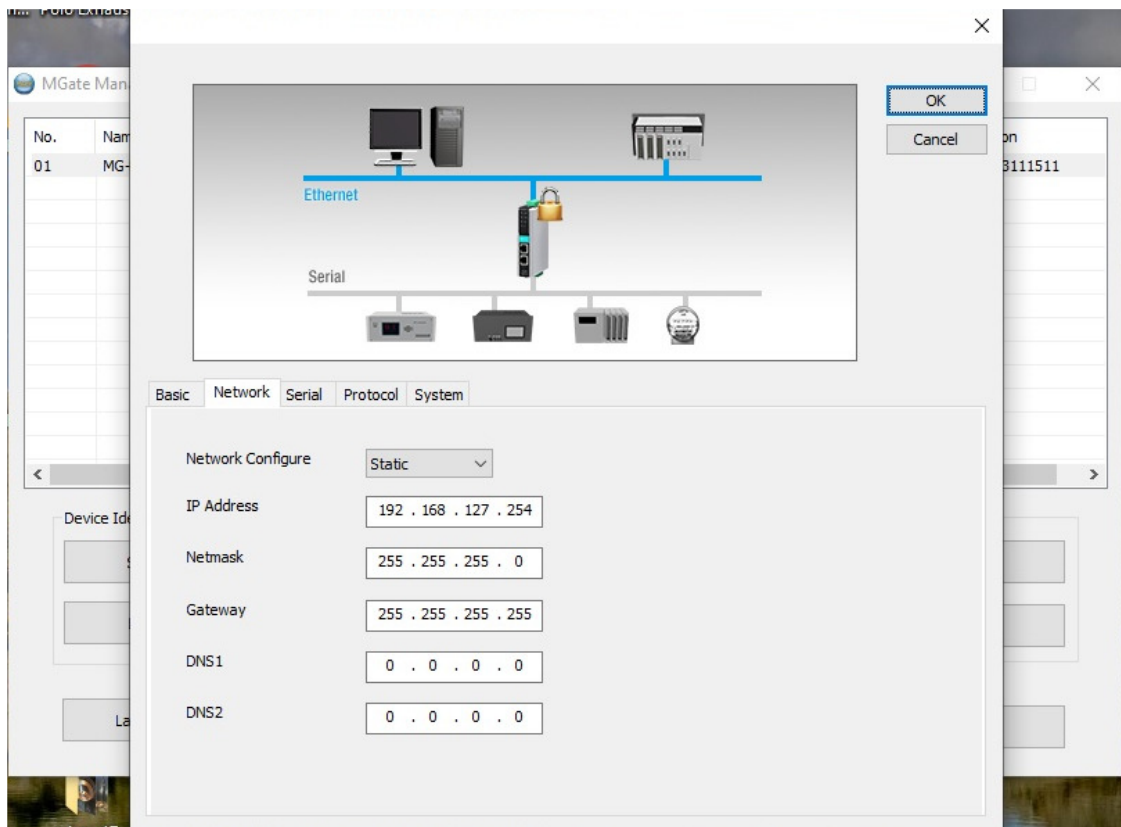
Click the “Configuration” button.

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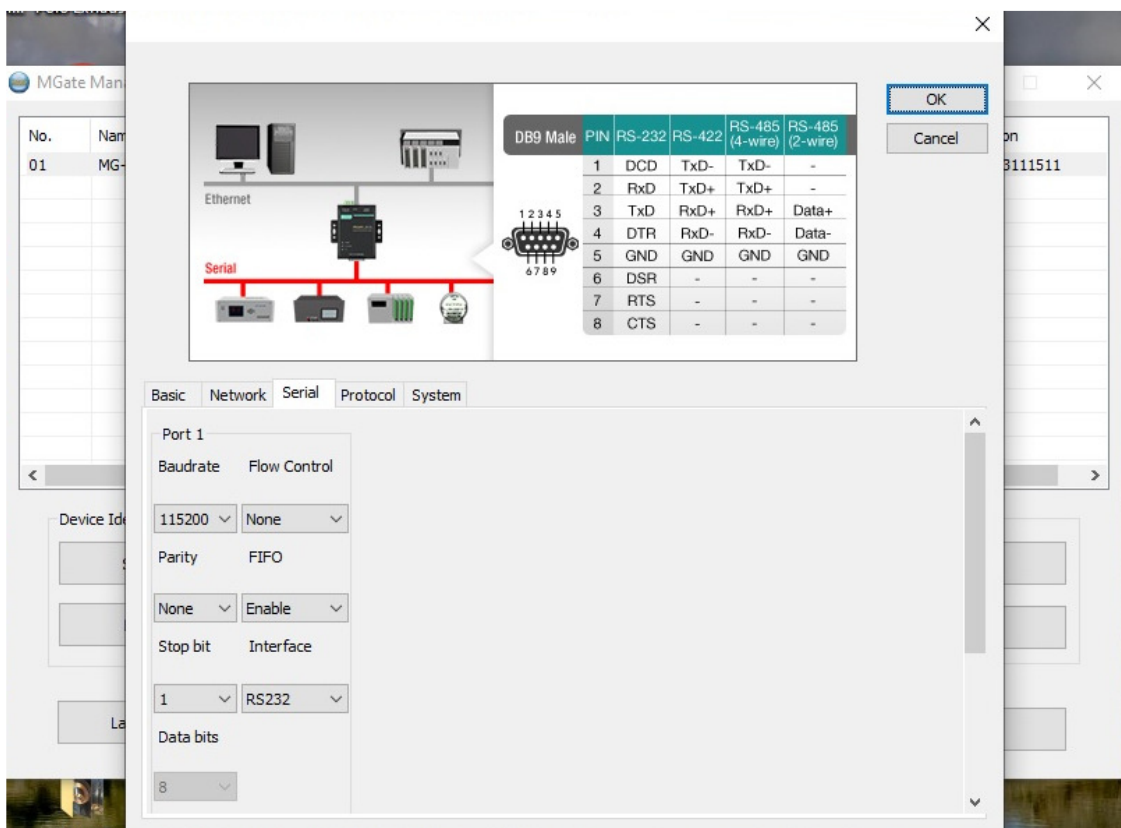
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e-mail: sales@churchill-controls.co.uk

Click the “Network” tab to observe the IP settings:



Click the “Serial” tab to observe the RS232 serial settings, e.g. 115200 baud rate:

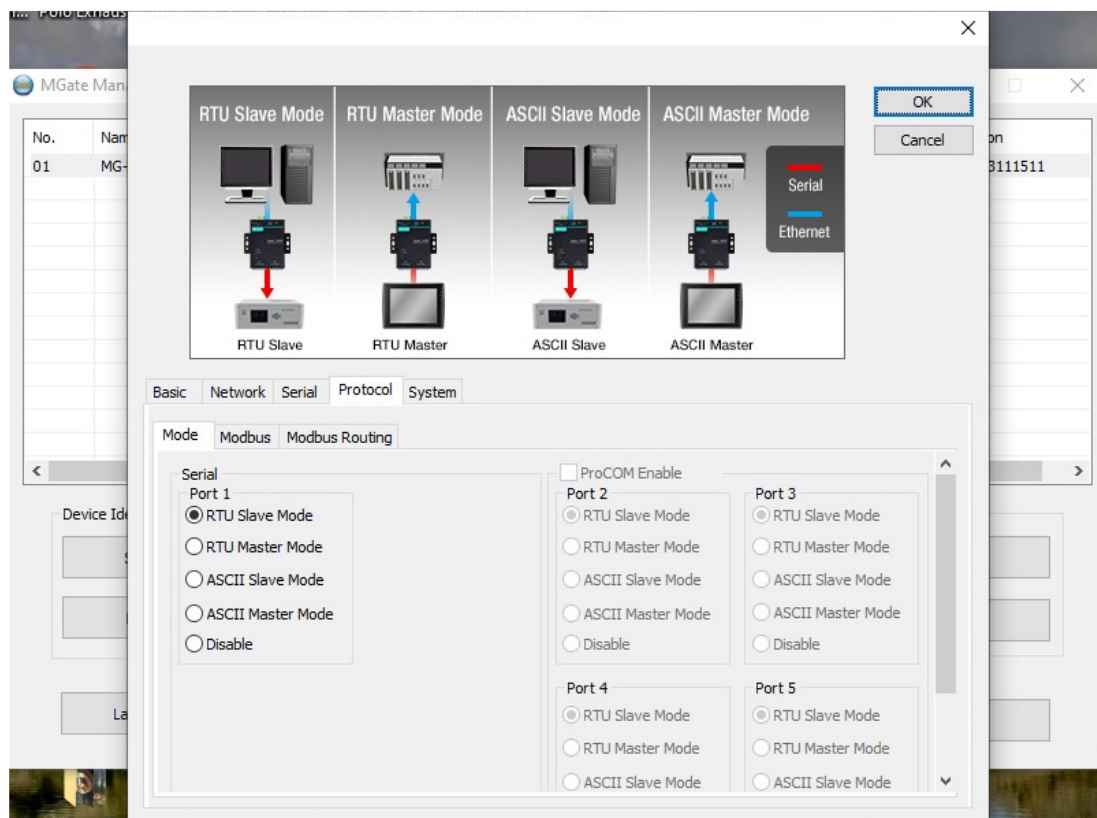


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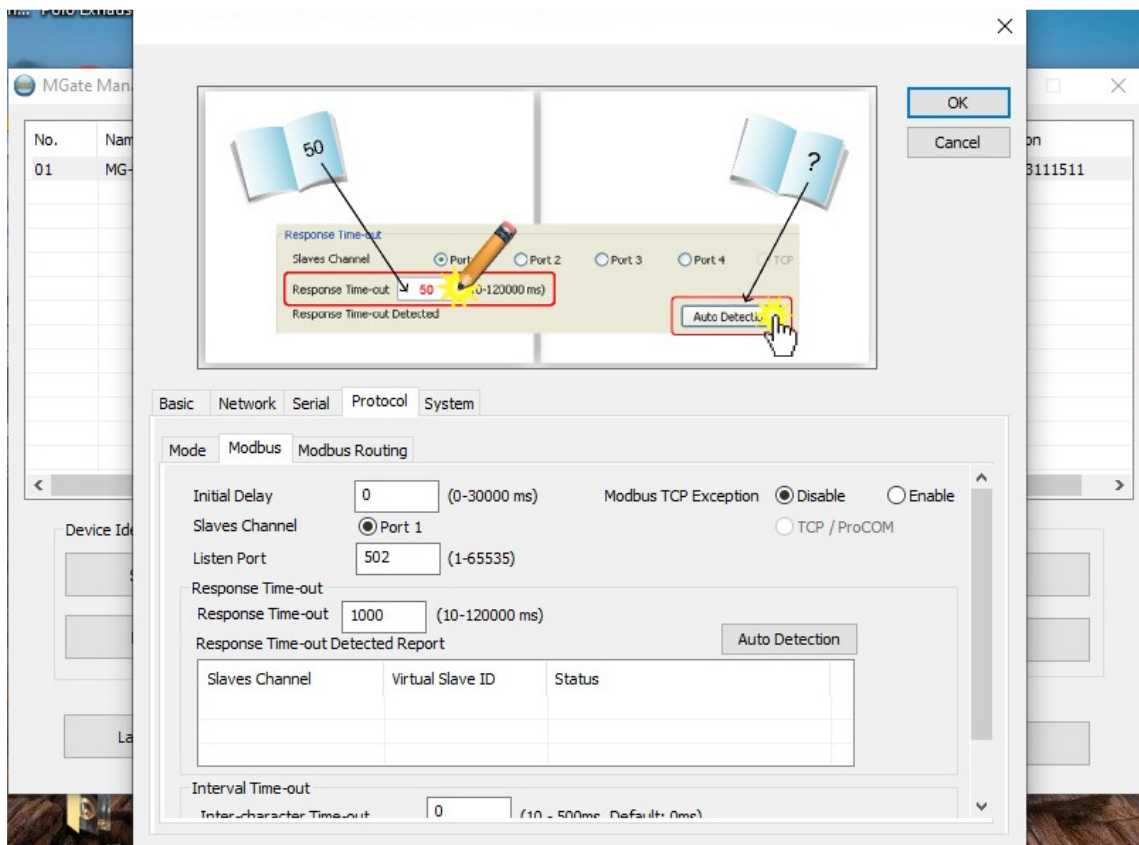
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Click the “Protocol” tab and “Mode” sub-tab, to observe the “RTU Slave Mode” setting for Port 1:



Click the “Modbus” sub-tab to observe the setting of the Listen Port is 502:

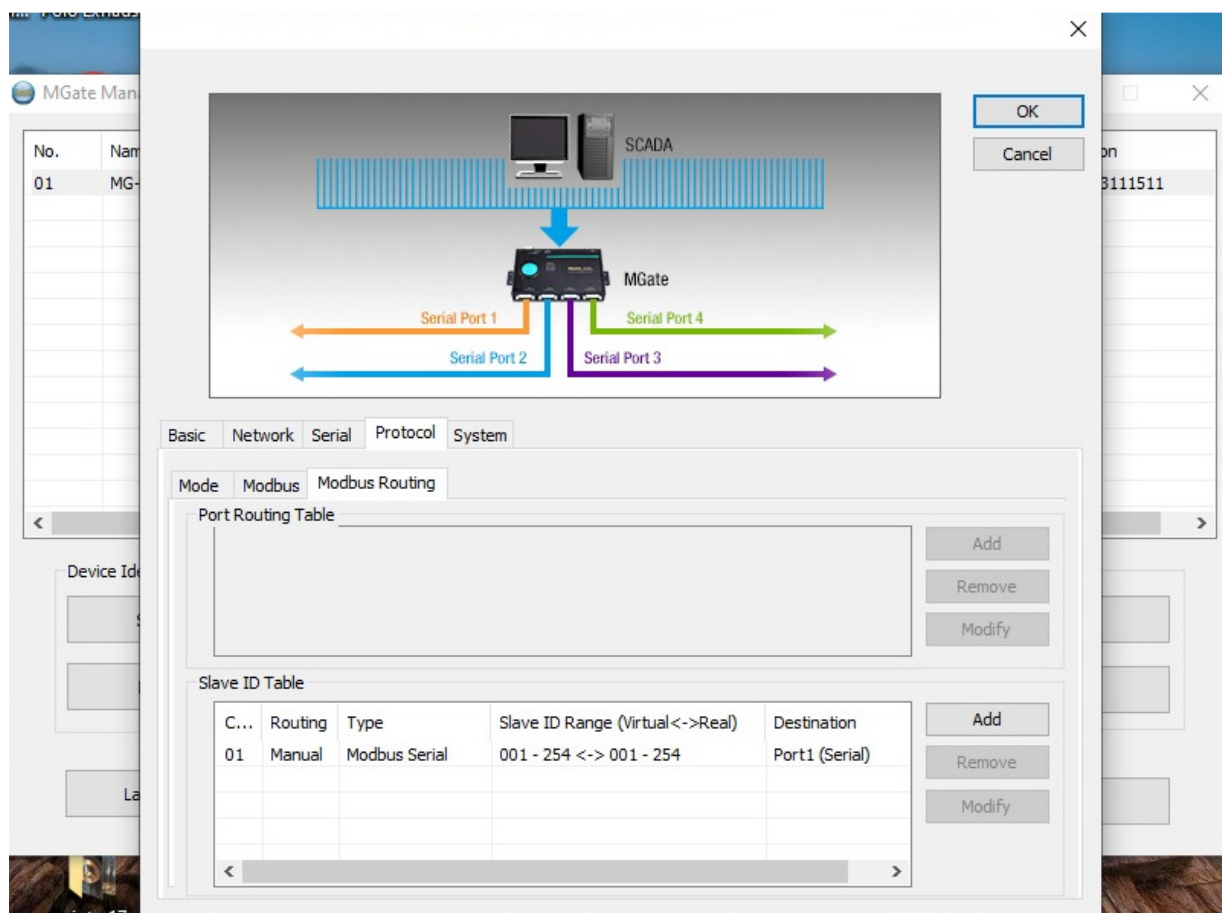


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Click the “Modbus Routing” sub-tab to observe that Port 1 is available for mapping Slave ID=1:

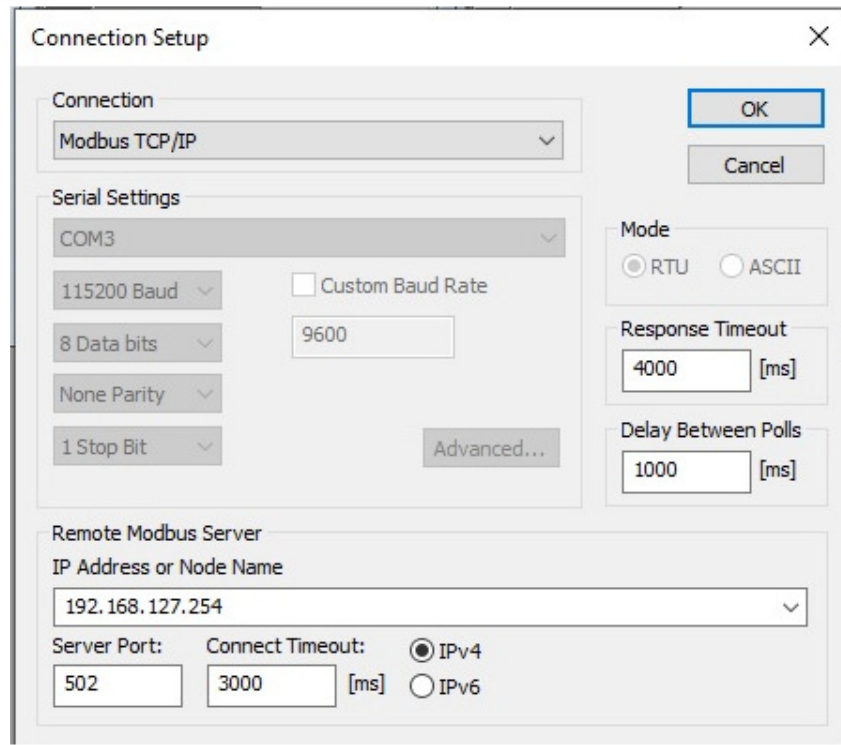


Annex 3 Modbus Poll Command Window Set-Ups for Example 1

The following connection window is required:

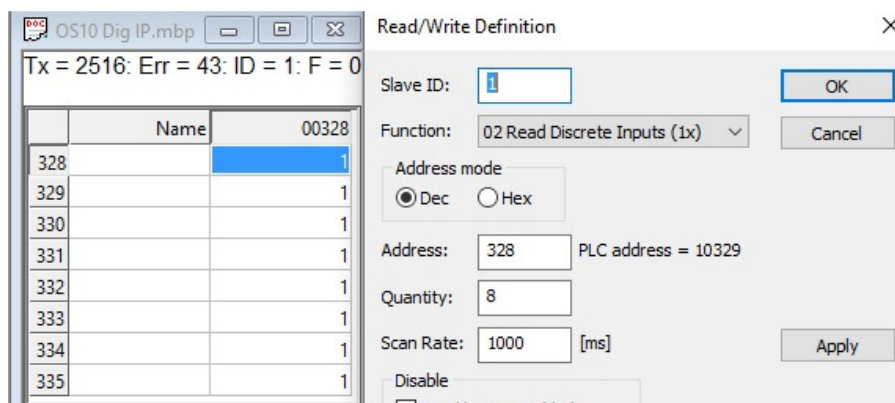
Select “Modbus TCP/IP” option.

The IP address if the Moxa MB3180 is set as 192.168.127.254.



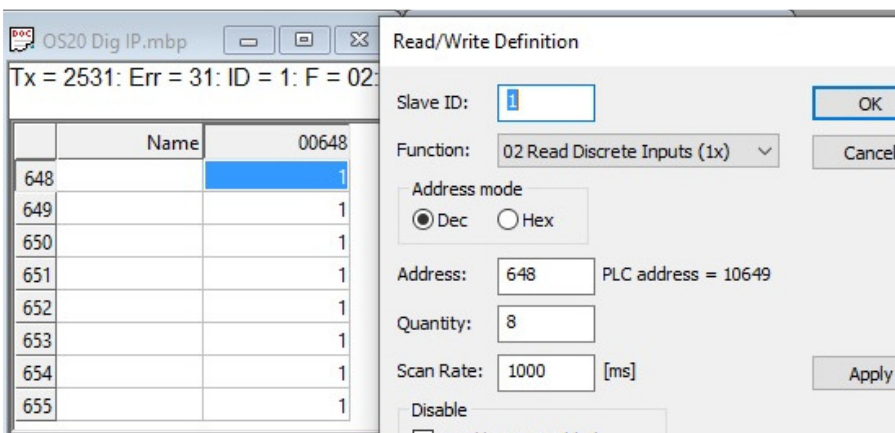
The Connection Setup dialog box is shown with the following settings:

- Connection:** Modbus TCP/IP
- Serial Settings:** COM3, 115200 Baud, 8 Data bits, None Parity, 1 Stop Bit. Custom Baud Rate is unchecked. Advanced... button is visible.
- Mode:** RTU (selected), ASCII (unselected)
- Response Timeout:** 4000 [ms]
- Delay Between Polls:** 1000 [ms]
- Remote Modbus Server:** IP Address or Node Name: 192.168.127.254
- Server Port:** 502
- Connect Timeout:** 3000 [ms]
- Protocol:** IPv4 (selected), IPv6 (unselected)



The OS10 Dig IP.mbp Read/Write Definition dialog box is shown with the following settings:

- Slave ID:** 1
- Function:** 02 Read Discrete Inputs (1x)
- Address mode:** Dec (selected), Hex (unselected)
- Address:** 328. PLC address = 10329
- Quantity:** 8
- Scan Rate:** 1000 [ms]
- Disable:** Read/Write Disabled (unchecked)



The OS20 Dig IP.mbp Read/Write Definition dialog box is shown with the following settings:

- Slave ID:** 1
- Function:** 02 Read Discrete Inputs (1x)
- Address mode:** Dec (selected), Hex (unselected)
- Address:** 648. PLC address = 10649
- Quantity:** 8
- Scan Rate:** 1000 [ms]
- Disable:** Read/Write Disabled (unchecked)

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OS30 Dig IP.mbp

Tx = 2593: Err = 28: ID = 1: F = 02

	Name	00968
968		1
969		1
970		1
971		1
972		1
973		1
974		1
975		1

Read/Write Definition

Slave ID:

Function: 02 Read Discrete Inputs (1x)

Address mode: ☒ Dec ☐ Hex

Address: PLC address = 10969

Quantity:

Scan Rate: [ms]

Disable: ☐ Read/Write Disabled

OK Cancel Apply

OS10 Ana IP.mbp

Tx = 136: Err = 0: ID = 1: F = 04:

	Name	00086
86		1776
87		3303

Read/Write Definition

Slave ID:

Function: 04 Read Input Registers (3x)

Address mode: ☒ Dec ☐ Hex

Address: PLC address = 30087

Quantity:

Scan Rate: [ms]

Disable: ☐ Read/Write Disabled ☐ Disable on error

OK Cancel Apply Read/Write On

OS20 Ana IP.mbp

Tx = 2641: Err = 21: ID = 1: F = 04:

	Name	00166
166		1878
167		3573

Read/Write Definition

Slave ID:

Function: 04 Read Input Registers (3x)

Address mode: ☒ Dec ☐ Hex

Address: PLC address = 30167

Quantity:

Scan Rate: [ms]

Disable: ☐ Read/Write Disabled ☐ Disable on error

OK Cancel Apply Read/Write C

3 os screens.mbp

Tx = 2653: Err = 26: ID = 1: F = 04

	Name	00246
246		2210
247		3575
248		1820
249		2616
250		1845
251		2569
252		3634
253		1845
254		3638
255		1842

Read/Write Definition

Slave ID:

Function: 04 Read Input Registers (3x)

Address mode: ☒ Dec ☐ Hex

Address: PLC address = 30247

Quantity:

Scan Rate: [ms]

Disable: ☐ Read/Write Disabled ☐ Disable on error

OK Cancel Apply Read/Write On View

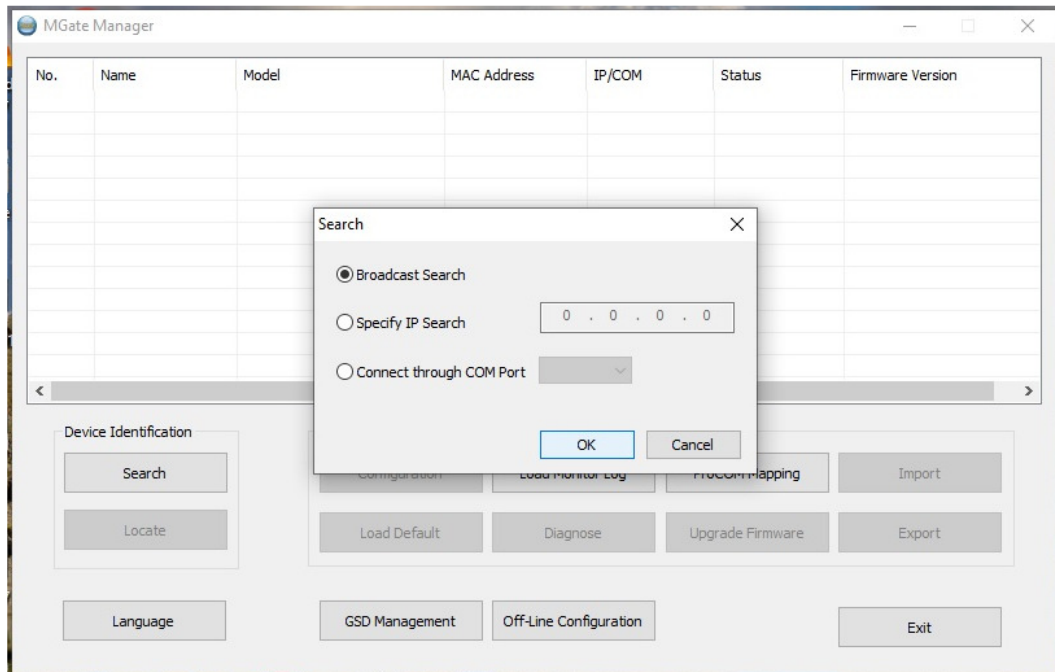
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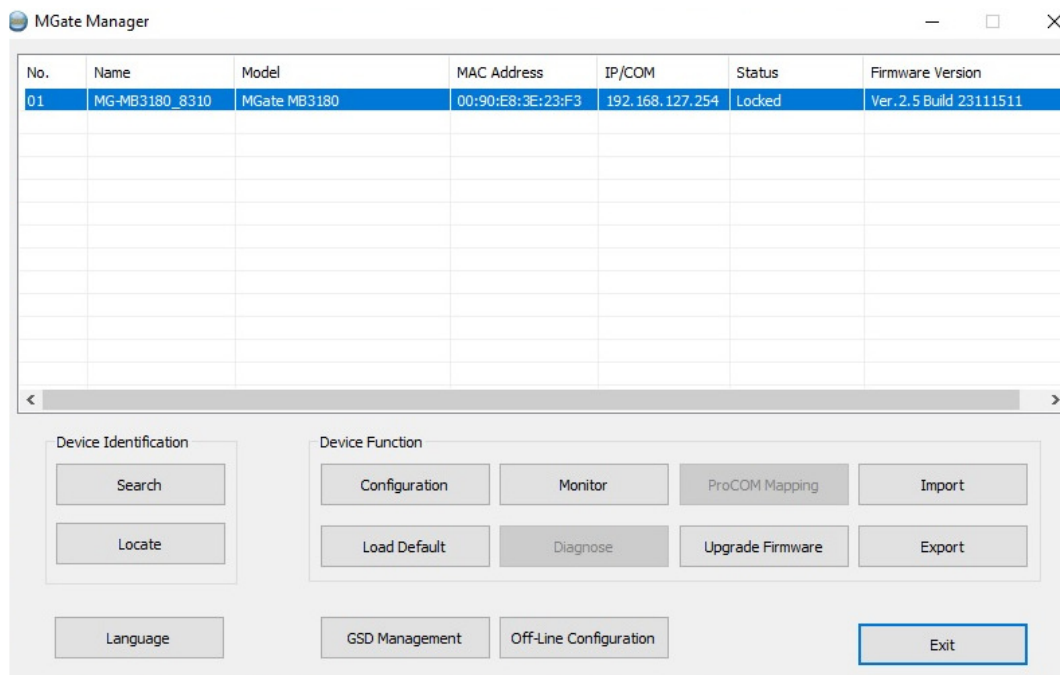
e-mail: sales@churchill-controls.co.uk

MOXA MGate Manager

Open MGate Manager and click on “Search” button:



and click OK for “Broadcast Search” option:



This shows the IP address of the unit is 192.168.127.254.

Highlight the line of the discovered device.

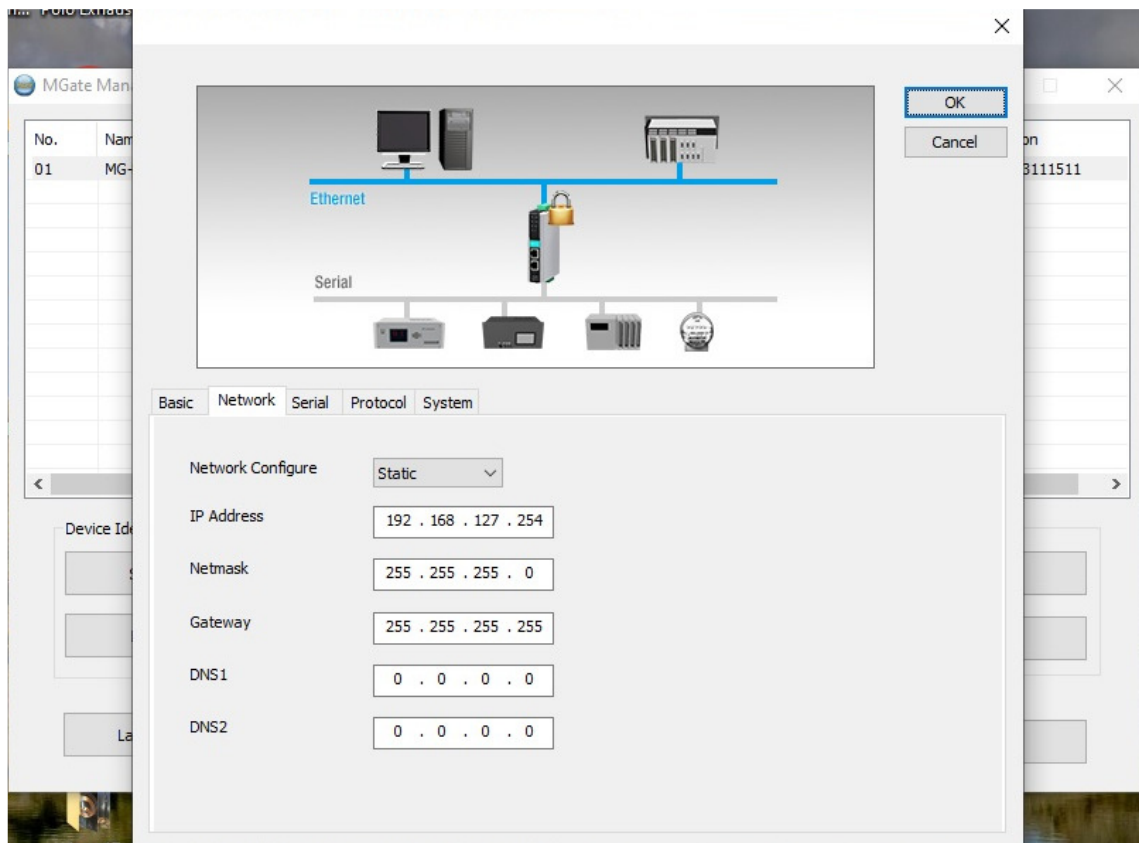
Click the “Configuration” button.

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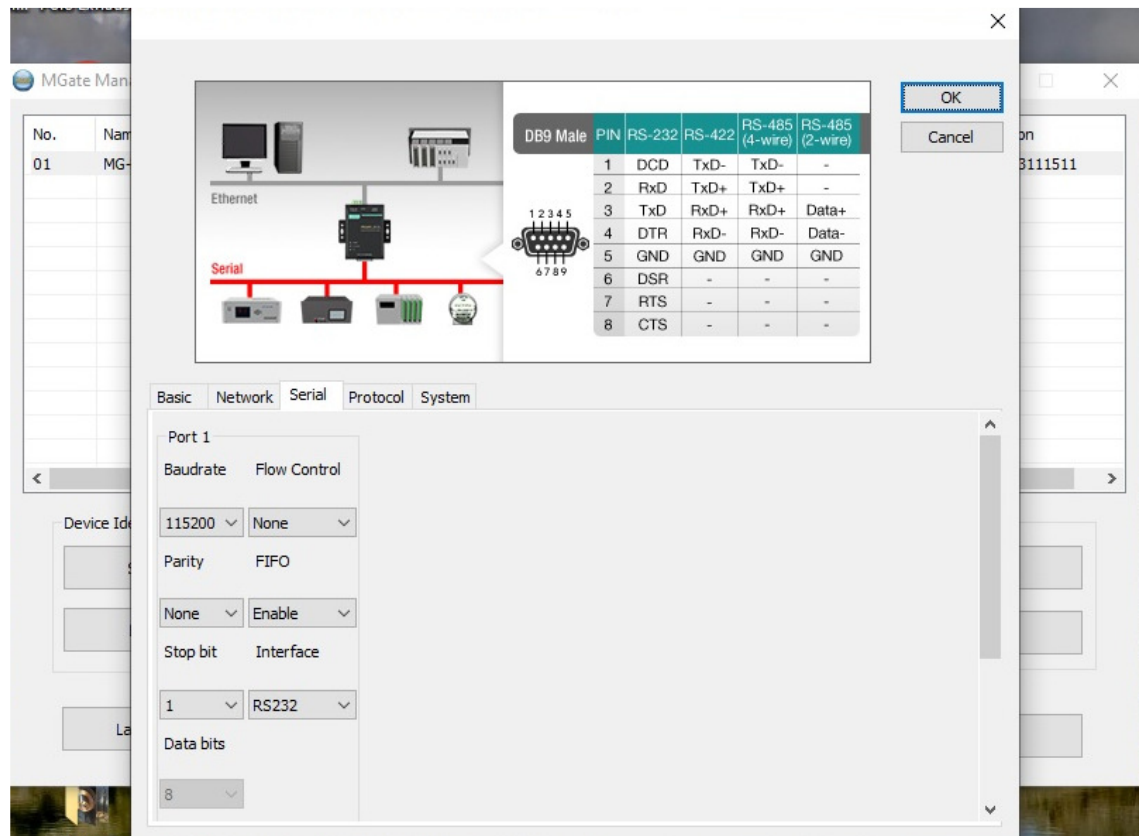
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Click the “Network” tab to observe the IP settings:



Click the “Serial” tab to observe the RS232 serial settings, e.g. 115200 baud rate:

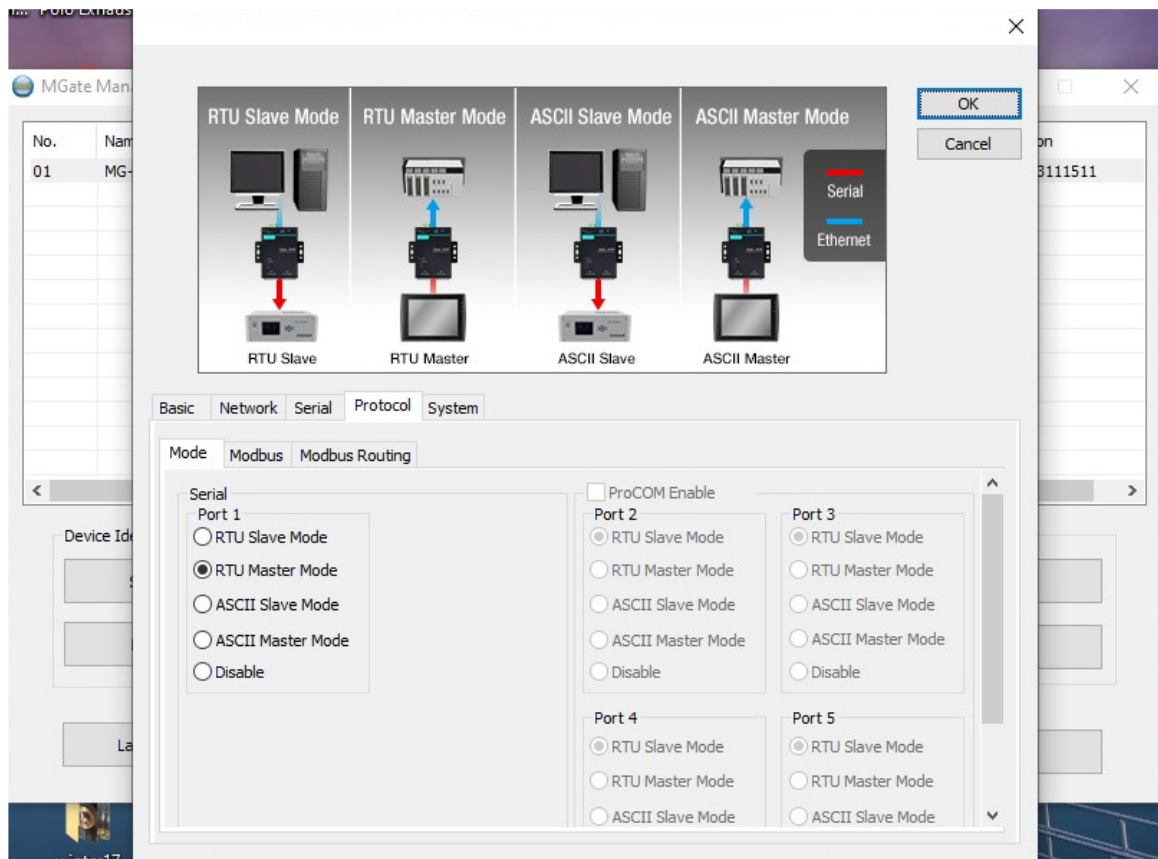


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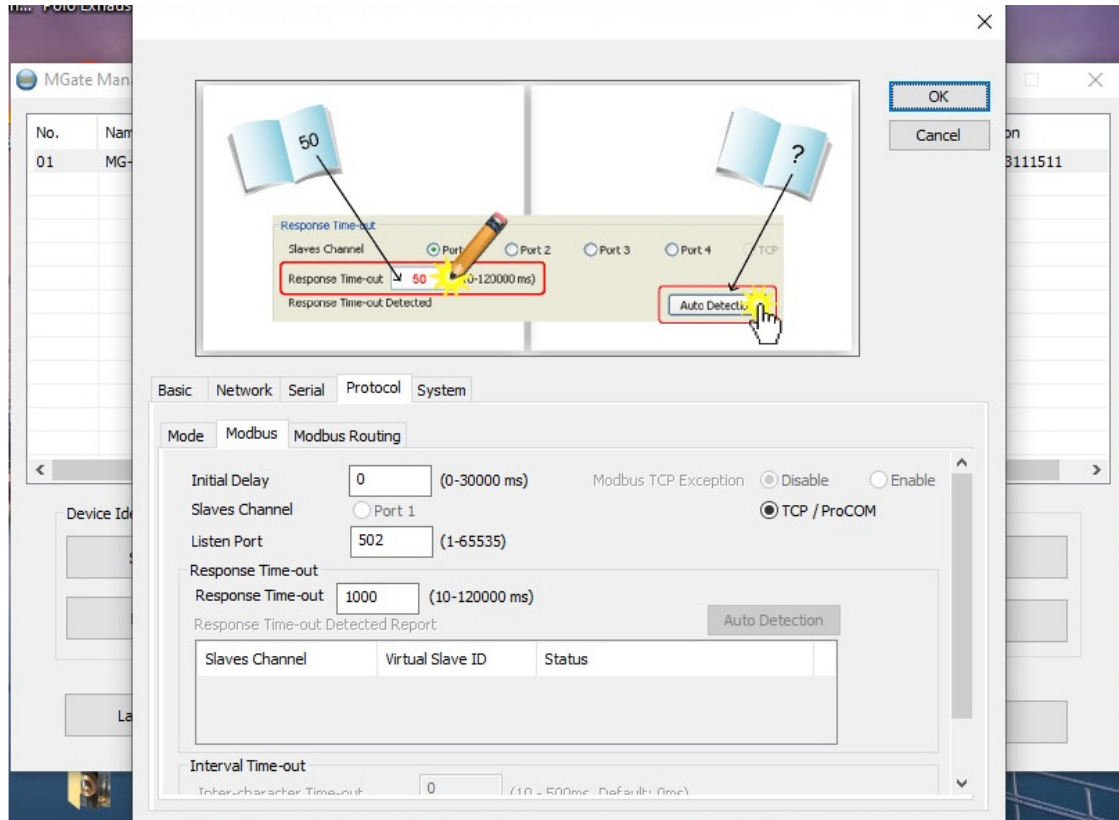
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Click the “Protocol” tab and “Mode” sub-tab, to observe the “RTU Master Mode” setting for Port 1:



Click the “Modbus” sub-tab to observe the setting of the Listen Port is 502:



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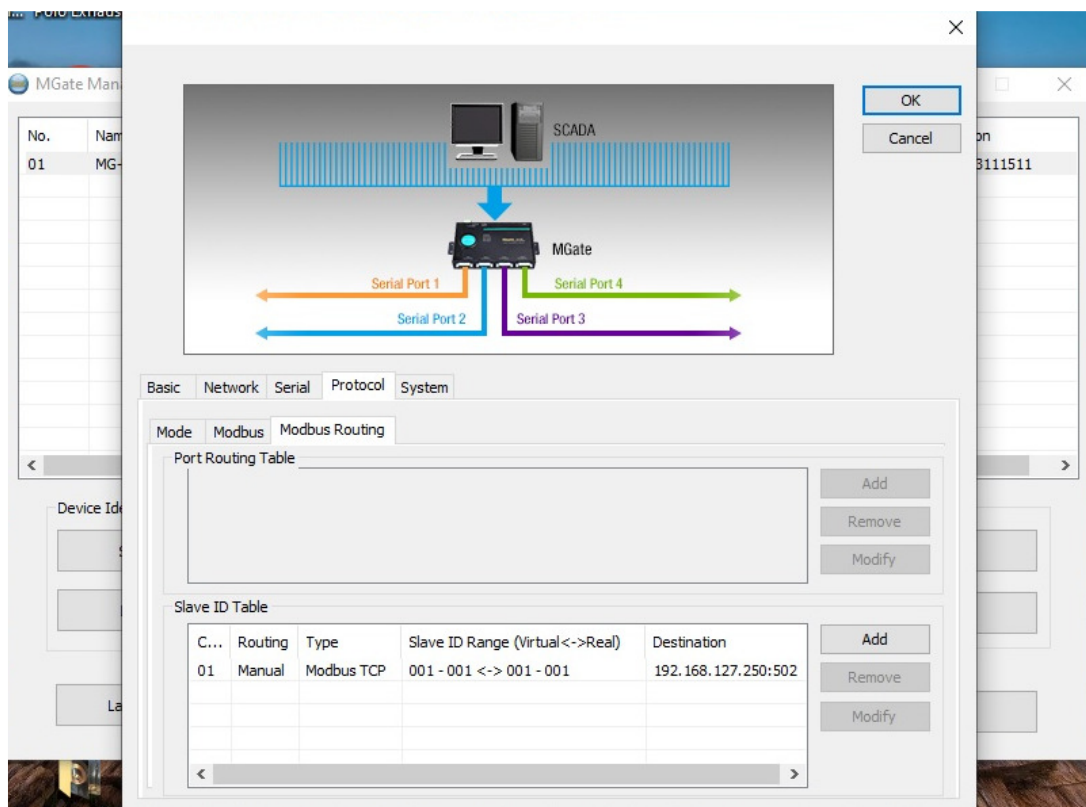
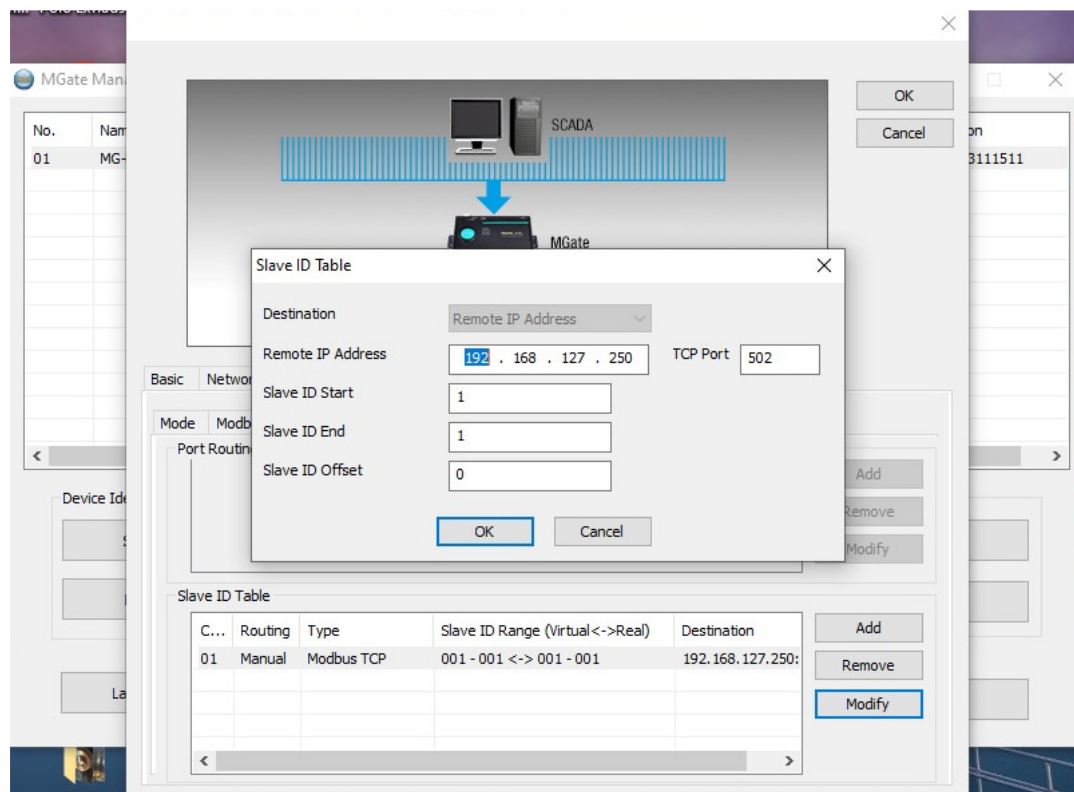
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Click the “Modbus Routing” sub-tab and click “Add” or highlight existing and click the “Modify” button.

Enter Min and Max ID =1 (this is the intended Slave ID address).

Enter the IP address of the destination Laptop (assuming the steps in Annex 1 have been followed) as shown below:

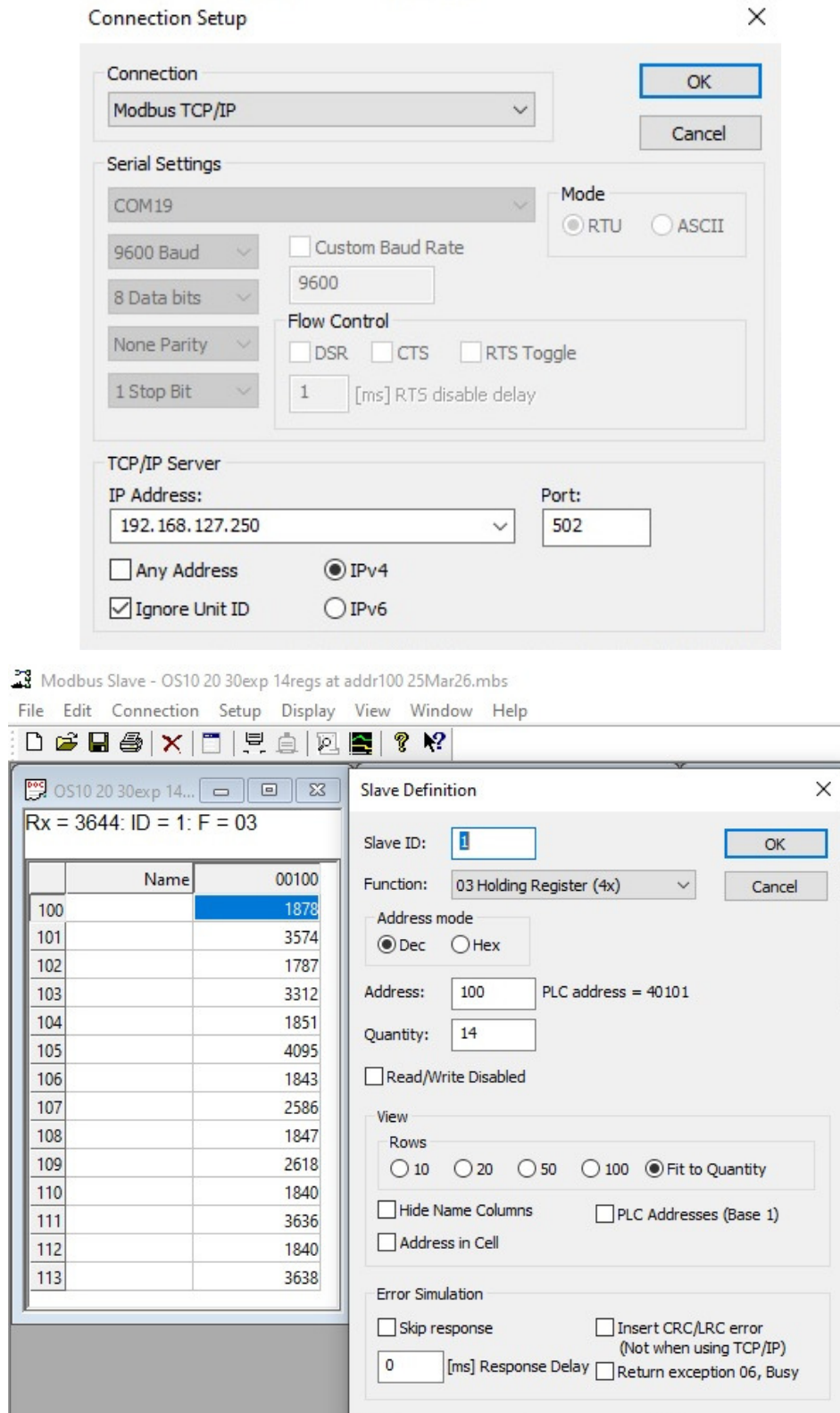


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NB: The IP Address of the Modbus Slave application simulating the PLC Slave must match that of the Laptop PC.



OS10 20 30exp... □ □ ✖

Rx = 3226: ID = 1: F = 01

	Name	00000
0		1
1		1
2		1
3		1
4		1
5		1
6		1
7		1
8		1
9		1
10		1
11		1
12		1
13		1
14		1
15		1
16		1
17		1
18		1
19		1
20		1
21		1
22		1
23		1

Slave Definition ✕

Slave ID: OK

Function: 01 Coil Status (0x) Cancel

Address mode
☒ Dec ☐ Hex

Address: PLC address = 00001

Quantity:

☐ Read/Write Disabled

View
 Rows
☐ 10 ☐ 20 ☐ 50 ☐ 100 ☒ Fit to Quantity

☐ Hide Name Columns ☐ PLC Addresses (Base 1)

☐ Address in Cell

Error Simulation
☐ Skip response ☐ Insert CRC/LRC error (Not when using TCP/IP)

[ms] Response Delay ☐ Return exception 06, Busy

OS10 20 30 co... □ □ ✖

Rx = 3003: ID = 1: F = 01

	Name	00025
25		1
26		1
27		1

Slave Definition ✕

Slave ID: OK

Function: 01 Coil Status (0x) Cancel

Address mode
☒ Dec ☐ Hex

Address: PLC address = 00025

Quantity:

☐ Read/Write Disabled

View
 Rows
☐ 10 ☐ 20 ☐ 50 ☐ 100 ☒ Fit to Quantity

☐ Hide Name Columns ☐ PLC Addresses (Base 1)

☐ Address in Cell

Error Simulation
☐ Skip response ☐ Insert CRC/LRC error (Not when using TCP/IP)

[ms] Response Delay ☐ Return exception 06, Busy

01 Coil status accepts write functions 05 and 15.
 03 Holding register accepts write functions 06, 16, 22 and 23.

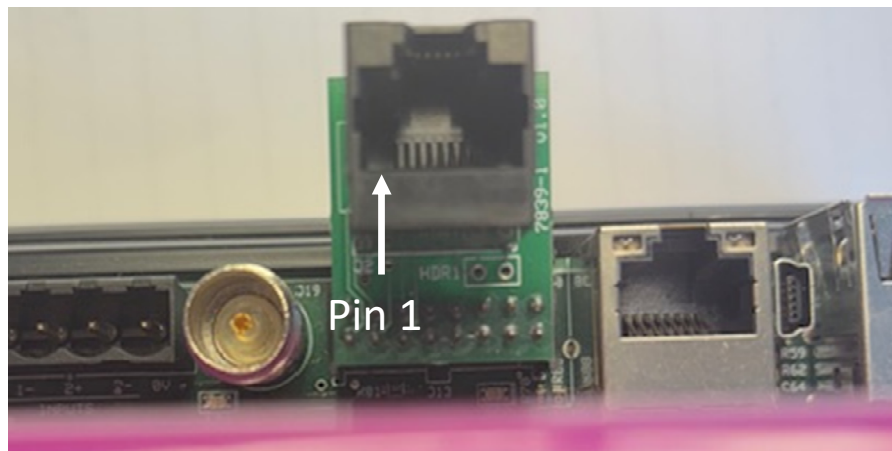
Churchill Controls Ltd._Unit 30 Wellington Business Park, Dukes Ride, Crowthorne, RG45 6LS

Tel: +44 (0)1344 750233

e-mail: sales@churchill-controls.co.uk

Mega_Link 2 COM 3 Adaptor Board, part number 7839-1.

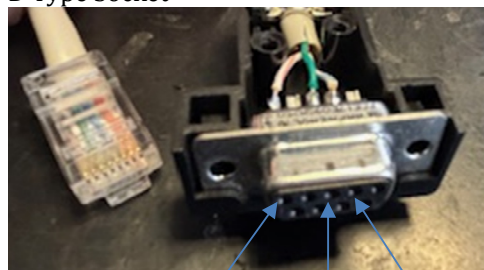
COM 3A/3B Adaptor



RS232 Serial Cable

Typical Cable Wiring details are as follows:

D-Type Socket



Pin 5
Orange/White

Pin 3
Green

Pin 2
Blue/White

Colour	Pin Number	Signal
Blue/White	2	Mega_Link 2 OUT
Green	3	Mega_Link 2 IN
Orange/White	5	0V

End.

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